The Ontario Task Force on Employment and New Technology

Employment and New Technology in the Office, Store and Business Machine Industry

An Appendix to the Final Report

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ONTARIO TASK FORCE ON EMPLOYMENT AND NEW TECHNOLOGY

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APPENDIX 10

EMPLOYMENT AND NEW TECHNOLOGY

IN THE OFFICE, STORE AND BUSINESS MACHINE INDUSTRY

This Appendix contains a report prepared for the Ontario Task Force on Employment and New Technology. The topic was approved in advance by the Task Force. At the conclusion of the study, the Task Force had the opportunity to review the report, but its release does not necessarily imply endorsement of the results by the Task Force or its individual members.

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FOREWORD

The Ontario Task Force on Employment and New Technology, a joint labour-management group, was established in May, 1984, "to consider and report on the manpower and employment implications of new technologies as the same may be introduced and applied in Ontario during the next decade and the extent and nature thereof."

To inform its discussions, the Task Force established a research agenda designed to gather information on employment and technological change from a wide variety of sources. The research agenda contained projects which gathered information of a historical nature, and projects with a future orientation which were designed to gather information describing likely occupational and employment implications associated with technological change in the 1985-1995 period.

The Appendices to the Final Report of the Ontario Task Force on Employment and New Technology contain reports of these research projects. A complete list of these Appendices may be found at the end of this document.

Among the Appendices are reports of a series of studies to assess the extent and nature of the employment implications of new technology in selected industries in Ontario. Appendix 3 describes the process by which the industries were selected, and contains the studies' terms of reference which called for particular attention to selected new technologies and occupational groups. Appendices 4-18 contain reports of these industry studies, which were conducted by Currie, Coopers & Lybrand, management consultants.

This particular appendix contains a report of the study on the Office, Store and Business Machine Industry.

Dr. Richard L. E. Brown, P.Eng.
Research Director

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The Task Force would like to thank the staff of Currie, Coopers & Lybrand, particularly Maureen Farrow and Victor Rocine, whose assistance in the conduct of this study is greatly appreciated.

Special thanks are due to all industry experts and survey respondents who provided information for this study.

EMPLOYMENT AND NEW TECHNOLOGY IN THE OFFICE, STORE AND BUSINESS MACHINE INDUSTRY

A Report Prepared by Currie, Coopers & Lybrand
for the Consideration of the Ontario Task Force
on Employment and New Technology

May 1985

Submitted By: Maureen Farrow
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EMPLOYMENT AND NEW TECHNOLOGY IN THE OFFICE, STORE AND BUSINESS MACHINE INDUSTRY

PART I - INTRODUCTION AND METHODOLOGY

1.0 INTRODUCTION

This report is one of a series of industry reports which summarize the findings of a major research project[1] undertaken for the Ontario Task Force on Employment and New Technology. Each report includes a historical analysis and an outlook to 1995 for the industry, and a review of the anticipated impacts of new technology on employment.

1.1 Structure of This Report

This report presents the study findings for Ontario's Office, Store and Business Machine Industry (SIC 318)[2]. The report includes four parts.

- The first part (Chapter 1.0) is the Introduction which includes a description of the approach and methodology.

- The second part (Chapter 2.0) is a Historical Analysis for the industry from 1971 to 1982 which provides background and a perspective on the industry's historical development.

- The third part (Chapters 3.0 to 7.0) discusses the results of the survey of firms in the industry and incorporates the interview findings with industry experts. These chapters cover:

  - a review of recent and anticipated technology adoptions,

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[1] Manpower and Employment Implications of New Technologies in Selected Manufacturing Industries in Ontario to 1995. The terms of reference of this assignment can be found in Appendix 3 to the Task Force's final report.

[2] 1970, Standard Industrial Classification (SIC), Statistics Canada.

- the outlook for the industry to 1995, including expected output and employment levels,

- effects on employment of new technology such as anticipated occupational shifts and changes in required skills,

- a review of the labour relations environment as it relates to new technology, and

- observations on planning efforts for technological change in the industry.

- Part four of the report includes various appendices that support the text of individual chapters.

1.2 Study Approach

The study approach selected incorporates the following research techniques:

- analysis of published statistics and reports on the industry, augmented by the working knowledge of industry specialists within Currie, Coopers & Lybrand,

- in-depth interviews with management and labour experts in the industry, conducted at various stages in the project, using structured interview guides, and

- an industry survey.

The reasons for the choice of these techniques are explained below.

1.2.1 Historical Analysis

The purpose of the historical analysis was to provide an informed perspective on the industry from which to view future trends. The historical analysis covers: the economic environment, competitive factors, output and employment patterns, productivity, technology adoption and the industrial relations environment. In order to permit cross industry analysis, consistent indicators and data sources were used.

1.2.2 Expert Interviews

At various stages in the project, a series of in-depth interviews were conducted with industry leaders, industry associations and union representatives. These experts have a broad understanding of the industry in terms of both its historical development and its future outlook. Their input assisted in the preparation of the historical analysis and in the survey design, and facilitated a clearer interpretation of the survey results.

1.2.3 Sample Survey of Firms

The following describes the key features of the survey.

Ontario firms in the Office, Store and Busines Machine Industry were identified using the 1982 Census of Manufacturers.[1]

[1] Manufacturing Industries of Canada: National and Provincial Areas, 1982, Statistics Canada, Catalogue No. 31-203.

All firms with twenty (20) or more employees were included in the sample frame. Employment in these firms is estimated to include 93 percent of the 10,485 employees (1982) in the Office, Store and Business Machine Industry in Ontario.

There were 29 firms in the industry in 1982[1] which had twenty or more employees. This group of firms, with twenty or more employees, was the base for selecting a sample of firms for the survey. Table 1 shows the number of firms in the sample frame, by size.

A representative, random sample of firms, stratified by employment size categories (see Appendix A), was chosen from the sample frame. The senior executive officer of each firm was identified and a structured questionnaire was sent to this individual. A copy of the survey questionnaire is attached as Appendix B together with an outline of the number of responses by question.

Consultants provided ongoing assistance to respondents, both on the telephone and in person, to complete the questionnaires. The questionnaire survey process generally ended with a personal interview. The number of firms and unions who participated in the sample survey are shown in Table 1, below.

1 The number of firms should not be confused with the number of establishments (62 in 1982). Establishments are production centres. Therefore, a firm may have more than one establishment.

TABLE 1: OFFICE AND STORE MACHINERY MANUFACTURERS

Firms by Employment Size	Number of Firms and Unions Responding By Firm Employment Size		Firms in Sample Frame (1)
	Firms	Unions	
Small (20-99)	1		2
Medium (100-499)	4		17
Large (500+)	2		10
Total Firms	7	0	29

(1) SOURCE: Statistics Canada, CENSUS OF MANUFACTURERS, 1982.

In most cases, several participants in each organization contributed to the completion of a questionnaire. In the Office, Store and Business Machine Industry survey, an average of 1.3 participants contributed per questionnaire. The companies' principal participants had an average of 18 years' experience with their firms and 27 years in the industry.

The sample survey results have been weighted up to the number of firms in the sample frame. That is, the survey results reported herein refer to the weighted survey results and are, therefore, representative of firms with twenty or more employees in the Office, Store and Business Machine Industry (SIC 318) in Ontario. Reliability of the sample is estimated at 99 percent, with a 5 percent allowable error. (See Appendix C for an explanation of the sample reliability calculation method).

Readers should be cautioned about the nature and reliability of the sample survey results. The questionnaire included a set of questions asking respondents about the future (i.e., five and ten years ahead) from a particular point in time. The results are, therefore, a representative sample of views about, and expectations for, the future and should not be viewed as what will necessarily take place. The survey provides a useful perspective from which to better understand how the industry perceives the future of new technology adoption and its anticipated impacts on employment.

The next chapter of the report discusses the historical analysis and subsequent chapters review the results of the sample survey and expert consultation which discuss the anticipated trends for the period 1985 to 1995.

PART II - HISTORICAL TRENDS 1971-1984

2.0 INTRODUCTION

This section of the report provides an historical analysis of trends in the Office, Store and Business Machine Industry for the period 1971 to 1981 and 1982 to 1984. Office and store machinery manufacturers in Ontario include 62 establishments that shipped products worth $823.2 million in 1982 and employed 10,485 people. Ontario accounted for almost 70 percent of Canadian manufacturers' shipments in 1982.

2.1 The Structure of the Industry

The Office, Store and Business Machine Industry includes establishments engaged in manufacturing office and store machinery such as typewriters, cash registers, coin-operated vending machines, mechanical computing machines, scales and balances. This industry also includes those firms that manufacture electronic computers, data processors and control devices. The largest category, accounting for nearly 53 percent of shipments is electronic computer equipment and parts (Table D.1 in Appendix D). Office machinery including cash registers and accounting machines accounts for just over one third of shipments with a total value of $395.6 million in 1981. Compared to these two categories other products are not prominent in this industry.

There are only 29 firms (excluding small businesses) in Ontario in 1982 classified to SIC 318, but the industry is dominated by a couple of firms. The largest company by far in this area is IBM Canada Ltd., followed by NCR Canada Ltd. The larger firms are subsidiaries of foreign (American) corporations while Canadian firms, such as Gandalf Data Ltd. and GEAC Canada Limited tend to be smaller and have more specialized product lines.

Shipments of goods of own manufacture showed a marked increase in 1981 over the previous year - up 30.7 percent. The growth of this industry can be almost entirely attributed to the increase in shipments of electronic computer equipment parts and sub-assemblies and office machinery.

2.2 The Market Environment

The products manufactured and distributed by this industry group have enjoyed mixed fortunes over the last ten years. For most of the companies it has been a decade of adaptation, and those companies that recognized and capitalized on the opportunities presented were successful. The companies that stuck with their traditional product range or designs fared badly. We have considered this further under the two major categories identified, i.e., office and store machinery and electronic computer equipment and computer parts. "Other products" are small relative to these two categories and consequently, are considered in less depth.

2.2.1 Office and Store Machinery

Most of the equipment in this category is keyboard-driven - the familiar "Qwerty" style keyboard for text and various arrangements of numeric keys for data. Ten years ago most of these keyboards were mechanical, but the signs of change were evident; the first, albeit crude (by today's standards) word processors were available and faster 10-key data entry keyboards with electronic displays were widespread. These developments were accompanied by the increasing sophistication in data networking, information processing and information exchange.

Thus, the companies at the forefront of the technology for producing mechanically-driven office and store equipment were racing to produce the best designed, lowest cost equipment. These companies included data processing based companies such as NCR, Burroughs and IBM. Because of its overall strength and marketing ability, IBM cemented its leadership role in

this period by supplying the steadily increasing white-collar work force with a series of high quality, well serviced electric typewriters, magnetic card typewriters, word processors and similar equipment. NCR concentrated more on the retail sector but lost ground, as did Burroughs. However, other new companies, such as AES Data of Montreal, recognized the full impact of the changes and were very successful in supplying dedicated word processors to offices. This success, which was in export as well as domestic markets, spawned other companies such as Micom; much of the manufacturing capacity of these companies was in Ontario.

Companies such as Pitney Bowes, which continued to supply more traditional mechanical office products, did not take advantage of the changes and growth that occurred in the seventies. These companies made products such as postage machines, letter openers and coin counters and, consequently, were not well placed to quickly take advantage of the electronics-driven advances in the office and store sector.

2.2.2 Electronic Computer Equipment and Computer Parts

This category continued as the dominant one in this sector. However, the changes paralleled those which took place in the office and store category as the microchip helped alter the design, size, speed, power and economics of computers. Over the decade, the cost of computer memory dropped from about $600,000 per megabyte to around $30,000.

This was achieved through the introduction of super minicomputers and minicomputers and, in the mid 1970's, the first microcomputers. As a result, large and medium sized companies sought to rationalize their data processing costs by bringing in smaller machines with greater performance to cost ratios. Small to medium sized organizations which had never used computers before found them affordable and manageable for the first time. The

critical product of the successful companies through this period was a well regarded, well supported mini-computer. This encouraged new companies, such as Digital Equipment Corporation (DEC) and Data General, to enter the field. Their success and the success of smaller, specialized, Canadian companies such as GEAC, helped transform the ranking of computer suppliers. Although IBM remained dominant, the other growth leaders e.g., Univac and Honeywell, were replaced by the minicomputer specialists. By the end of the seventies, the microcomputer specialists, such as Apple, stimulated the next logical step toward economical desk-top "personal" computing.

As in the office and store category, foreign multi-nationals, mostly U.S.-based, dominated this category. Two market approaches were revealed by the companies in both categories; new, innovative companies such as Apple, DEC and, in Canada, AES, created approaches which made quantum leaps over former technologies. Other more established companies then had to "catch up". IBM proved that its hold on the marketplace was so strong that it, in effect, made the market wait while it produced its response. Thus, in this period, IBM's hardware and protocols became the "de facto" standard for the industry worldwide and in Canada. Thus, the recognition that many companies had to be IBM compatible to survive was recognized and this became a central plank in the strategy of many of IBM's competitors.

As stated, "other products" are less important. They are a series of small products supporting or complementing those of the other two categories.

All three categories were subject to two key trends in the seventies. The technology driven changes, detailed above, are evident in most offices and stores today. Less evident, possibly, was the realization that office employment was growing

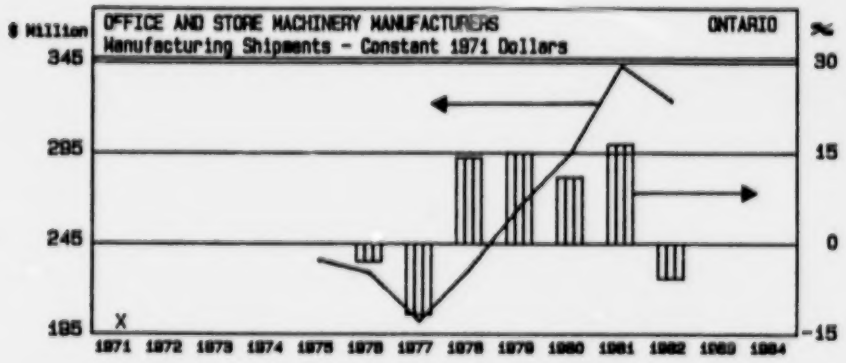
to become the dominant employment category and that the capital investment and productivity of this group was lagging that of the industrial and agricultural groups. Thus, improvement of "white collar" productivity became an important goal of many organizations and it encouraged them to be more adventurous in the purchase of new equipment. These driving forces and values have continued into the eighties.

2.3 Industry Trends

Tables D.2 to D.5 present key industry indicators for the years 1971 to 1984. These tables are presented in Appendix D, Historical Tables.

2.3.1 Aggregate Output

EXHIBIT 1



Data for 1972 to 1974 not available (see Table D.4).

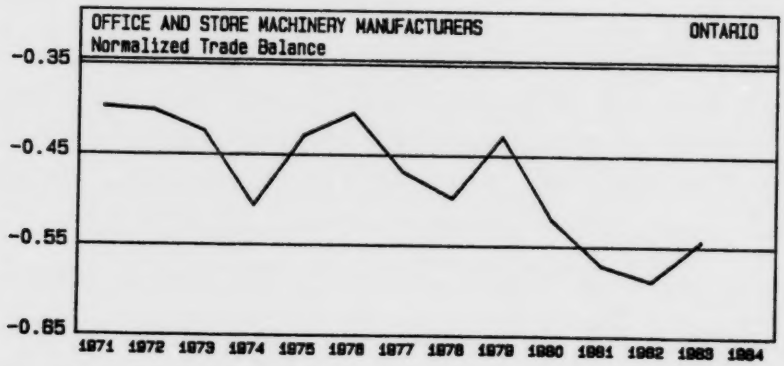
Current dollar manufacturing shipments of office and store machinery manufacturers in Ontario increased from $198.1 million in 1971 to $799.9 million in 1981, exhibiting an average annual growth rate of 15.0 percent. In 1982 manufacturing shipments were $823.2 million, an increase of only 2.9 percent over 1981 levels.

In constant 1971 dollars, manufacturing shipments of office and store machinery manufacturers increased from $198.1 million in 1971 to $343.1 million in 1981, experiencing an average annual growth rate of 5.6 percent. Constant dollar figures are not available for the period 1972 to 1974 (see Table D.4) but the volume increase in shipments averaged 4.4 percent a year, reaching a level of $235.5 million in 1975. In the following two years, the industry experienced subsequent declines in constant dollar shipment activity of 2.9 and 11.7 percent. These could be explained as an after effect of the general economic slowdown in 1975. Also, this was a period just prior to the push for increased office automation.

From 1978 to 1981, the Office, Store and Business Machine Industry experienced a series of healthy real increases in shipments, averaging 14.2 percent per year. Most of this increase was accounted for by electronic equipment such as word processors and point of sale scanners. The severe recession in 1981/1982 had a dampening effect on the industry, as users postponed their investment in machinery and equipment. But relative to some other industries, the decline in constant dollar manufacturing shipments in 1982 was not that drastic - only 5.8 percent - resulting in shipments of $323.3 million.

2.3.2 Competitive Position

EXHIBIT 2

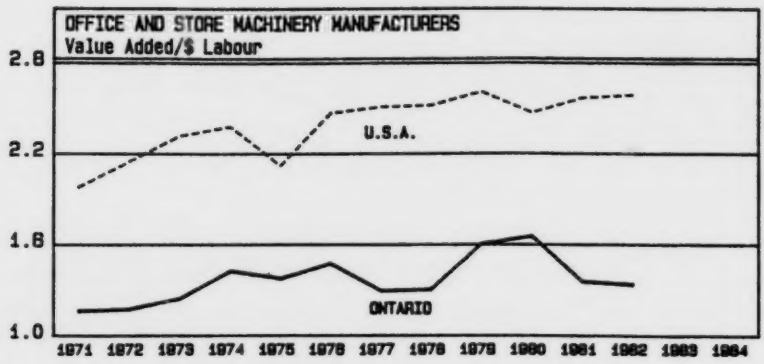


Since 1971, Ontario has continually suffered a negative trade balance in office and store machinery. Ontario's normalized trade balance (exports minus imports divided by exports plus imports) has deteriorated further from mid 1970 levels, indicating that the negative trade balance has been increasing over the last few years. In the early to mid 1970's, imports were approximately two and a half times the value of exports, increasing to just over three times in the late 1970's and early 1980's.

The reason for this lopsided trade balance was that in the largest product category of office and store machinery - electronic computers and parts - foreign based companies have the leading edge in technology. American firms like IBM and NCR dominate the market.

The United States supremacy is also evident in the value added per dollar of labour analysis. Ontario value added per dollar of labour for the most part fluctuated between 50 and 60 percent of the United States figure, exceeding those limits only once in recent years when it temporarily peaked at about two-thirds of the United States figure.

EXHIBIT 3



The difference in value added per dollar of labour can be partially explained by the fact that the United States was on the leading edge in applications of new technologies, and could take advantage of productivity gains plus large economies of scale.

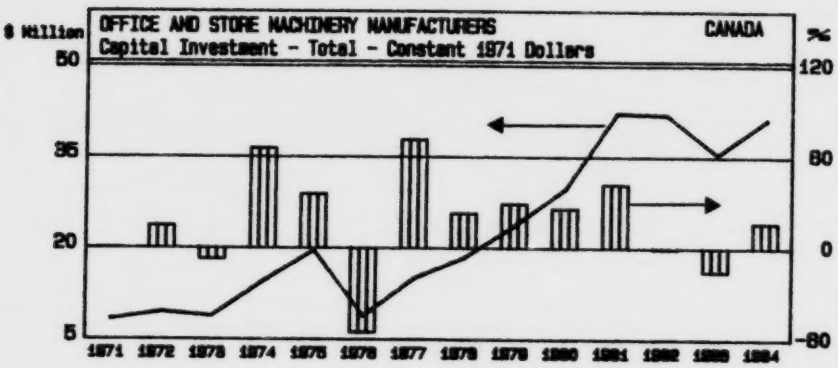
2.3.3 Capital Investment

Capital investment statistics are only available for Canada as a whole for SIC 318; however, in 1982, Ontario based manufacturers of office and store machinery accounted for 69.8 percent of Canadian shipments of these products.

In current dollars, total capital investment increased from $8.2 million in 1971 to 103.1 in 1981, and is expected to increase to $117.6 million in 1984. The overall trend for capital spending was positive throughout the time period, with declines in 1976 and again in 1983.

In constant 1971 dollars, capital investment increased at an average annual rate of 17.8 percent between 1971, ($8.2 million) and 1981 ($42.1 million). In 1982, capital spending remained relatively constant at just under $42 million, and then decreased by 15.6 percent to $35.3 million in 1983. It is expected to regain its $40-$42 million level in 1984.

EXHIBIT 4



The mix between construction spending and machinery and equipment spending tends to lean more towards the latter.[1] Investment in construction gained importance between 1980 and 1982 accounting for over 44 percent of total investment over the period. However, the machinery and equipment component accounts for most of the capital investment in this industry fluctuating from a low of 55.5 percent to a high of 79.0 percent of total capital investment.

Construction spending was $3.0 million (in constant dollars) in 1972. Spending had increased to $18.6 million by 1982. Construction spending then dropped to $9.8 million in 1983 and is expected to improve somewhat in 1984 to $11.2 million (in constant dollars). From the data available one can see that construction spending experienced large increases in 1977 and 1980, though the levels attained were not always significant.

Machinery and equipment spending was $6.4 million (in constant 1971 dollars) in 1972. Spending then increased to $23.2 million in 1982 and is expected to be $29.9 million in 1984.

2.3.4 Employment

The discussion of employment includes an analysis of aggregate trends and occupational changes.

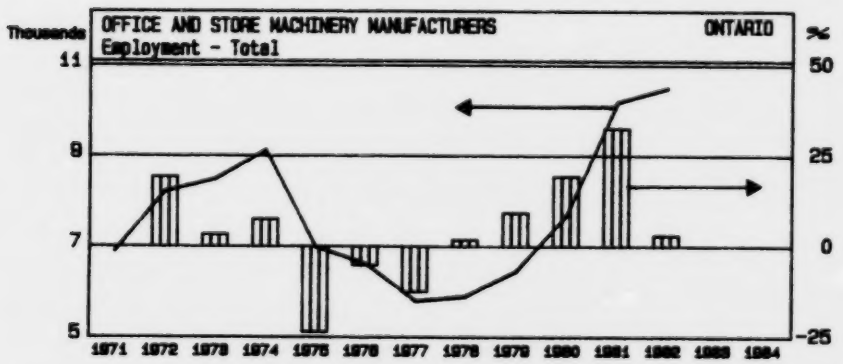
---

1 For the years 1971, 1973 to 1975 inclusive and 1981 no breakdown is available between construction investment and machinery and equipment investment.

- Aggregate Trends

In this section of the report two sources of employment data are used in order to provide the level of analysis required. Total employment trends are taken from Statistics Canada, Manufacturing Industries of Canada: National and Provincial Areas, Cat. No. 31-203. This data series is based on the census of manufacturing industries conducted by Statistics Canada annually. This data series is used as it shows the year to year trend in total employment. In order to analyze the employment trends by occupation, the Census of Canada has been used. However, this data is only available for the census years 1971 and 1981. These two series differ because of differences in coverage and methodology and this should be noted.

EXHIBIT 5

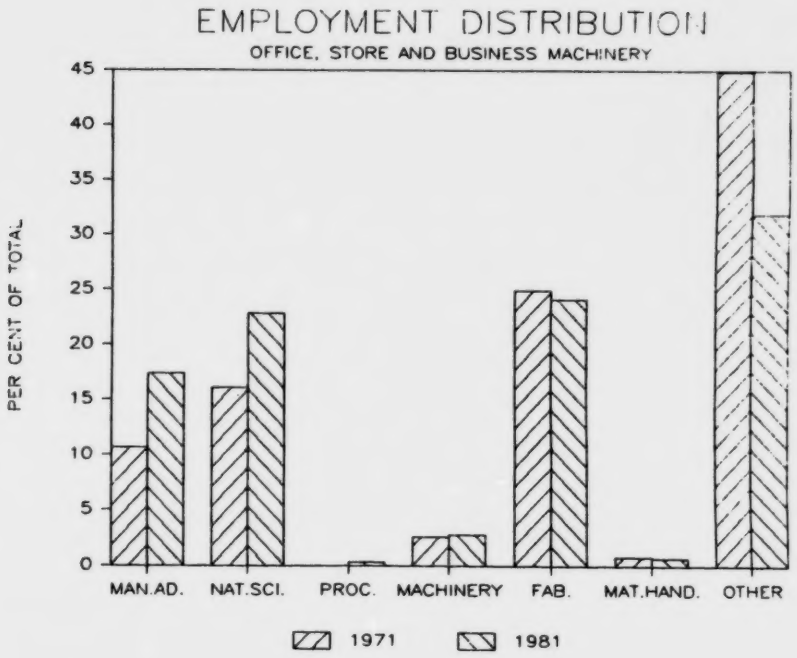


Total employment in Ontario in the Office and Store Machinery Industry was 10,485 in 1982 compared to 10,176 in 1981 and 6,878 in 1971. Growth in the 1971 to 1981 period averaged 4.0 percent at annual rates for total employment. During this time period there were three years of pronounced declines, from 1975 to 1977 inclusive. Employment in 1974 stood at 9,111 and by 1977 it had dropped to 5,780, an overall decline of 36.6 percent. From that point on

employment levels increasingly improved with the largest increase occurring between 1980 and 1981 when employment increased by 32.6 percent. In 1982, the latest year available, employment continued to increase though not as rapidly as in the three previous years.

- Occupational Changes

EXHIBIT 6



The census data for Ontario show that total employment increased by 1.9 percent per annum over the 1971 to 1981 period. Table D.6 indicates that the Processing broad occupational group showed the highest average annual growth rate, 23.1 percent, but it also was the least significant group, accounting for less than one percent of employment in 1981. Natural Sciences, Engineering and Mathematics (2,765 employees) and Managerial, Administrative and Related (2,115 employees) both had average annual growth

rates, above the industry average, of 5.5 percent and 7.1 percent respectively. These two groups accounted for over 40 percent of employment in the Office, Store and Business Machine industry in 1981.

The largest broad occupational group in 1981 was the Other category (32 percent of total employment), two-thirds of which consisted of clerical occupations. The second largest broad occupational group in 1981 was Product Fabricating, Assembling and Repairing which had 2,930 employees accounting for just over 24 percent of total employment. This group lagged behind the growth rate for the industry, exhibiting an average annual growth of 1.6 percent from 1971 to 1981. The Machining and Related occupations grew at an average annual rate of 2.5 percent, but represented only 2.8 percent of total employment. The remaining occupational group - Material Handling and Related - represented only 80 employees in 1981 and was completely stagnant, showing no change from 1971 levels.

Some of the occupations at the more detailed level within the Product Fabricating, Assembling and Repairing group exhibited growth rates seven to ten times above the industry average. These particular occupations were all related to electronic equipment such as: inspecting and testing, fabricating, assembling, installing and repairing, electrical, electronic and related equipment (13.9 percent growth rate); electronic equipment fabricating and assembling (15.8 percent growth rate); and electronic and related equipment installing and repairing, n.e.c. (19.0 percent growth rate). These three categories accounted for over 40 percent of employment in this area. The other occupations, either showing declines or modest growth were related to conventional business and commercial equipment.

The largest category within the Product Fabricating, Assembling and Repairing group was business and commercial machine mechanics and repairmen, with 510 employees in 1981 and which experienced the largest decline within that group of 7.5 percent. Business and commercial machine fabricating and assembly showed a modest average annual growth rate of 2.2 percent, while employing 485 people in 1981.

The largest group at the more detailed occupational level within Natural Sciences, Engineering and Mathematics was systems analysts and computer programmers, accounting for nearly 37 percent of employment in this field. This group's share of total employment declined from 1971 levels as its average annual growth rate was only 0.9 percent. The other two major categories, electrical engineers (545 employees) and architectural and engineering technologists and technicians (550 employees) both exhibited strong average annual growth rates of 10.0 and 12.1 percent respectively. Draughtsmen were one of the smallest categories but exhibited the highest average annual growth rate (18.4 percent).

Within the Managerial, Administrative and Related occupations the only occupation to experience a decline (of 1.9 percent) was occupations related to management and administration, n.e.c. All the rest of the occupations experienced average annual growth rates that exceeded the industry average. The highest growth rate, of 23.1 percent, was exhibited by production managers, while the most significant group, accountants, auditors and other financial officers (18.9 percent of total employment in this field) had one of the lower average annual growth rates, of 5.2 percent.

Table D.7 indicates that by 1981, women accounted for almost one-third of employment in office and store machinery manufacturing compared to 24.5 percent in 1971. This was explained by an increase of 1,450 new jobs for women since 1971. The greatest proportion (26.4 percent) of women were found in Product Fabricating, Assembling and Repairing occupations. They also made up 35.2 percent of total employment in this area, an increase from 14.2 percent in 1971. Two other occupational groups where women accounted for over one-third of employment in 1981 were Machining and Related jobs and Processing jobs, though these two occupational groups only account for 3.5 percent of all women employed in this industry.

Women increased their position in all the broad occupational groups, except that of Material Handling where their share of total employment dropped from 37.3 to 31.3 (but this only accounted for the loss of five jobs). They were least represented in Natural Sciences, Engineering and Mathematical occupations, 12.3 percent, and had the greatest participation in Processing occupations, 37.5 percent.

PART III - FUTURE TRENDS: THE SURVEY RESULTS

Part III of this report presents the survey results which discuss the firms' surveyed opinions as to future trends in technology adoption and employment impacts.

3.0 ADOPTION OF NEW TECHNOLOGY

This chapter reviews the expected trends in the adoption of new technologies in the Office, Store and Business Machine Industry and the factors driving the need and affecting the rate of technology adoption.

3.1 New Technologies and Rates of Adoption

The range of new technology adopted before 1985 by firms in the industry depends upon the size of firm. Large firms have taken advantage of much available new technology while smaller firms have incorporated relatively few new systems into their manufacturing processes up to the present. However, small and especially medium sized firms plan significant purchases in the 1985 to 1990 period. Beyond 1990 most firms, regardless of size, are uncertain about their plans for adopting new technology. These views are detailed in Table 2, below.

3.1.1 Product Technologies

Office and store machinery manufacturers are already making widespread use of microprocessors in their products, and firm size is not a factor, with 79 percent of the industry involved. In contrast, large firms are already producing multifunctional machines, while medium sized firms have made beginnings here but plan to push their adoption rate higher before 1990. Small firms have formed no plans to begin production of these machines.

Results of Question 3

TABLE 2: OFFICE AND STORE MACHINERY MANUFACTURERS

SIC 318

Percent of Firms Planning to Adopt New Technologies by Employment Size (1)

Technologies	Before 1985				1985-1990				1990-1995			
	Small	Medium	Large	Total	Small	Medium	Large	Total	Small	Medium	Large	Total
1. PRODUCT TECHNOLOGIES												
With Installed Microprocessors	100	75	100	79	-	25	-	21	-	-	-	-
Multifunctional Machines	0	50	100	46	-	50	-	42	-	-	-	-
2. DESIGN TECHNOLOGIES												
Computer-Aided Design (CAD)	0	25	100	26	100	75	-	74	-	-	-	-
Computer-Aided Engineering (CAE)	0	25	100	26	100	75	-	74	-	-	-	-
CAD/CAM Integration	0	25	50	23	100	25	50	35	-	-	-	-
3. MANUFACTURING PLANNING AND CONTROL TECHNOLOGIES												
Computerized Financial Systems	0	50	100	46	100	25	-	33	-	-	-	-
Computerized Order Entry/Inventory Control	0	75	100	67	-	25	-	21	-	-	-	-
Computer-Aided Process Planning	0	0	100	5	-	75	-	62	-	-	-	-
Manufacturing Resource Planning Systems (MRP)	0	0	100	5	-	75	-	62	-	-	-	-
Automated Shop Floor Data Collection	0	0	100	5	-	25	-	21	-	-	-	-
Computerized Decision Support Systems	0	0	100	5	100	75	-	74	-	-	-	-
Computerized Maintenance Planning and Control	0	0	100	5	-	-	-	-	-	-	-	-
4. MANUFACTURING PROCESS TECHNOLOGIES												
Computerized Process Control Systems	0	0	100	5	-	25	-	21	-	-	-	-
Computer-Aided Inspection and Testing	100	25	100	38	-	50	-	42	-	-	-	-
Robotic Applications	0	0	100	5	-	25	-	21	-	50	-	42
Flexible Manufacturing Technologies	0	0	50	2	-	-	-	-	-	25	-	21
Computer Integrated Manufacturing (CIM)	100	0	100	17	-	25	-	21	-	-	-	-
5. MATERIALS HANDLING TECHNOLOGIES												
Automatic Bulk Handlers/Feeder Systems	0	0	50	2	-	-	-	-	-	-	-	-
Automated Conveyor/Vehicle Systems	0	0	50	2	-	-	-	-	-	-	-	-
Automated Storage and Retrieval	0	0	100	5	-	-	-	-	-	-	-	-
Computer Controlled Conveyor/Vehicles	0	0	50	2	-	-	50	2	-	-	-	-
Automated Warehouse	0	0	50	2	-	-	-	-	-	-	50	2
6. TELECOMMUNICATIONS TECHNOLOGIES												
Facsimile (FAX) Link: HO/Plant(s)	0	25	100	26	-	25	-	21	-	-	-	-
Computer Link: HO/Plant(s)	0	25	100	26	-	50	-	42	-	-	-	-
Computer Link: Suppliers/Customers	0	50	100	46	-	-	-	-	-	-	-	-
7. OTHER TECHNOLOGIES	0	0	50	2	-	-	50	2	-	-	50	2

(1) '0' used prior to 1985 to indicate have not adopted. '-' used for periods 1985-1990 and 1990-1995 to indicate respondents, at the time of the survey, are not planning to adopt this technology or 'don't know'. Responses are not mutually exclusive.

3.1.2 Design Technologies

Manufacturers have acquired computers to assist in design and engineering. Small firms have invested in design only, other firms in both, with industry penetration at 26 percent for both CAE and CAD. Integration of these systems is less widespread than overall utilization, having been undertaken by just 23 percent of the industry. Small and medium sized firms expect to be heavy purchasers of computers for engineering applications in the years to 1990 as they catch up on large firms. Further gains in integration will result, as 35 percent of the industry is expected to make efforts in this area.

3.1.3 Manufacturing Planning and Control Technologies

The contrast between large and small firms is strongly evident. Computer applications for financial systems, process planning and decision support have fully penetrated planning and control activities among the former and have yet to be considered by the latter. Medium sized firms are only just beginning to adapt computers to these tasks. However, they plan to acquire a full range of these systems in the coming five years. Small firms have formed very limited future plans in this area, focusing on financial and decision support applications.

3.1.4 Manufacturing Process Technologies

Large firms have taken the lead in adopting new technology in the physical production of output. Computers are again a significant element in transforming production. Small firms have been equally quick to incorporate advances in inspection and testing and computer integrated manufacturing.

Medium size firms are expected to be prominent purchasers of testing equipment in the 1985 to 1990 period, with 50 percent of firms planning to begin or expand use of computers for inspection and testing. Medium size firms will follow large firms into computer applications for process control and integrated manufacture. Since medium size firms are a large share of the industry, industry trends to 1990 will closely follow these firms' plans.

Looking farther ahead, to the 1990's, medium size firms foresee the steady spread of robotics in manufacturing as well as the introduction of flexible manufacturing technologies. Large firms have already begun to use robots and 50 percent of the medium size firms are planning purchases for the 1990 to 1995 period.

3.1.5 Materials Handling Technologies

Only the largest firms have adopted such new technology as automated bulk handling and automated storage and retrieval. Future plans are limited as well, with no significant investment determined at present.

3.1.6 Telecommunications Technologies

The industry has made moderate headway in linking plants with head office and firms with customers and suppliers. Again, all large firms have begun to use these technologies, but others have followed, especially in establishing links beyond the firm. Indeed, 46 percent of the industry report having computer links with customers or suppliers. Medium size firms are expecting to significantly enlarge their within-firm links over the next five years.

3.2 Forces Driving the Need to Adopt New Technology

Two major factors are influencing the surveyed firms to adopt new technology. Large and medium size firms cited competitive pressures as the single most important spur to innovation. This is closely followed in importance for medium size firms by customer demands for changes. Respondents feel that their customers look to those firms which are perceived to be innovative. Producers respond to this by producing goods which reinforce this perception. Hence their listing of quality as another force driving innovation.

Large firms are concerned not only about competitive pressures but also about increasing productivity. They expect a steady decline in some of their products' prices, due in part to innovation and are concerned about maintaining revenue per employee. New technology becomes the key to increasing labour productivity.

Small firms cite strategic reasons for adopting new technology. They too are sensitive to customer needs, since their focus is on being positioned to produce new products for the industry that they serve. Survey results are presented in Table 3.

3.3 Forces that Could Slow the Rate of Technology Adoption

Respondents listed a wide variety of factors that might impede innovation. In some cases there are problems in financing investments in new technology, especially considering recent poor economics conditions. Some firms expect these conditions to persist for their customers, limiting market growth and aggravating financing problems.

Results of Question 4

TABLE 3: OFFICE AND STORE MACHINERY MANUFACTURERS — SIC 318

Most Important Factors Driving Need to Adopt New Technologies

Factor		Percent of Firms by Employment Size			
		Small (20-99)	Medium (100-499)	Large (500+)	Total Firms
COMPETITIVE PRESSURES	First	0	75	50	65
	Second	0	0	0	0
	Third	0	0	0	0
	Weighted Importance (1)	0.0	2.3	1.5	1.9
STRATEGIC	First	100	0	0	12
	Second	0	0	0	0
	Third	0	0	0	0
	Weighted Importance	3.0	0.0	0.0	0.4
CUSTOMER DEMANDS FOR CHANGES	First	0	25	0	21
	Second	0	75	0	62
	Third	0	0	0	0
	Weighted Importance	0.0	2.3	0.0	1.9
INCREASE PROFITABILITY	First	0	0	0	0
	Second	0	0	50	2
	Third	0	0	0	0
	Weighted Importance	0.0	0.0	1.0	0.1
INCREASE PRODUCTIVITY	First	0	0	50	2
	Second	0	0	50	2
	Third	0	0	0	0
	Weighted Importance	0.0	0.0	2.5	0.1
INCREASE QUALITY	First	0	0	0	0
	Second	0	25	0	21
	Third	0	25	50	23
	Weighted Importance	0.0	0.8	0.5	0.7
OBSOLESCENCE	First	0	0	0	0
	Second	0	0	0	0
	Third	0	0	50	2
	Weighted Importance	0.0	0.0	0.5	0.0
ALL OTHERS	First	0	0	0	0
	Second	100	0	0	12
	Third	0	0	0	0
	Weighted Importance	2.0	0.0	0.0	0.2

(1) Weighted Importance = (First % x 3) + (Second % x 2) + (Third % x 1)

Results of Question 5

TABLE 4: OFFICE AND STORE MACHINERY MANUFACTURERS SIC 318

Most Important Factors that Could Slow the Rate of New Technology Adoption

Factor		Percent of Firms by Employment Size			
		Small (20-99)	Medium (100-499)	Large (500+)	Total Firms
ABILITY TO FINANCE	First	0	0	50	2
	Second	0	50	0	42
	Third	0	25	0	21
	Weighted Importance (1)	0.0	1.3	1.5	1.1
COMPETITIVE ENVIRONMENT	First	0	0	0	0
	Second	0	0	0	0
	Third	0	25	0	21
	Weighted Importance	0.0	0.3	0.0	0.2
POOR ECONOMIC CONDITIONS	First	100	0	0	12
	Second	0	50	0	42
	Third	0	0	0	0
	Weighted Importance	3.0	1.0	0.0	1.2
LACK OF SKILLS AND/OR KNOW-HOW TO IMPLEMENT	First	0	25	0	21
	Second	0	0	0	0
	Third	0	0	0	0
	Weighted Importance	0.0	0.8	0.0	0.6
LACK OF NEW TECHNOLOGY STANDARDIZATION	First	0	0	0	0
	Second	0	0	50	2
	Third	0	0	0	0
	Weighted Importance	0.0	0.0	1.0	0.1
ALL OTHERS	First	0	75	0	62
	Second	0	0	0	0
	Third	0	0	0	0
	Weighted Importance	0.0	2.3	0.0	1.9

(1) Weighted Importance = (First % x 3) + (Second % x 2) + (Third % x 1)

Medium sized firms mention related problems such as profitability and utilization - combining problems related to business conditions with achieving minimum scale for efficient operation - as limiting factors. Many firms also refer to government interference, not just lack of government assistance, as being a significant drag on adoption of new technology.

4.0 INDUSTRY OUTLOOK TO 1995

This chapter reviews the anticipated outlook for the Office, Store and Business Machine Manufacturing Industry in terms of aggregate output (i.e., manufacturing shipments in Ontario), investment plans, aggregate employment and changes in occupational structure to 1995.

4.1 Output to 1995

The industry has resumed the healthy growth that characterized it in the late 1970's and expects to continue to experience strong growth in the coming decade. Constant dollar shipments are estimated to have grown by 7.5 percent in 1984.

Many survey respondents had difficulty estimating industry growth in the future because of the diversity of products and manufacturing processes in the industry. The results shown in Table 5 for medium and large firms have been strongly influenced by the rapid growth rates expected by the segment of the industry which is closely involved in incorporating computer functions and microprocessors into office and store machinery. Other industry segments have much lower expectations, on the order of 1-5 percent growth per annum in constant dollar shipments, and these expectations may be under-reported in the survey.

As far as future expectations, the industry generally anticipates continuing strong growth through to 1995 in a 17.0 to 17.5 percent range, with medium size firms anticipating the largest gains.

4.2 Investment Patterns

The firm respondents indicate that they expect to concentrate investment expenditures in machinery and equipment. The new technology component of this investment is expected to be about 75 percent of the total between 1985 and 1995, with the share level being highest for the large firms.

Results of Question 1

TABLE 5: OFFICE AND STORE MACHINERY MANUFACTURERS SIC 318

Manufacturing Shipments in Ontario

Average Annual Compound Rate of Change (in Constant Dollars) (1)

Firms by Employment Size	Estimated			Expected	
	1982-1983	1983-1984	1984-1985	1985-1990	1990-1995
Small (20-99)	10.0	-17.0	-11.0	0.0	5.0
Medium (100-499)	8.0	10.5	12.0	20.0	19.5
Large (500+)	18.0	14.0	20.0	15.0	15.0
Total Firms	8.5	7.5	9.0	17.0	17.5

(1) Rounded to closest 0.5%.

4.2.1 Justifying Financial Investment in New Technology

As with other investment, new technology investment is subjected to formal tests of profitability. The industry appears to require a return on investment of about 13 percent to justify the application of funds to new equipment. However, only about 30 percent of the industry applies a formal return on investment (ROI) rule. The use of a pay-back period criterion is widespread, applying to an estimated 73 percent of the industry. Firms expect to pay off new investment in two years. Survey results are presented in Table 6.

4.2.2 Sources of New Capital Spending

The industry expects to finance 65 percent of anticipated investment expenditure from internal funds. Small and large firms plan to finance all expenditures internally, while medium size firms will use internal funds for an estimated 57 percent of expenditures of new equipment. Table 7 summarizes these results.

Results of Question 17e

TABLE 6: OFFICE AND STORE MACHINERY MANUFACTURERS — SIC 318

Justifying Financial Investment in New Technology

Firms by Employment Size	Pay-Back Period		Return on Investment	
	% of Firms Using Pay-Back	Average Period (Years)	% of Firms Using ROI	Average Rate (%)
Small (20-99)	100	2	0	-
Medium (100-499)	67	2	33	12.0
Large (500+)	100	3	100	24.0
Total Firms	73	2	30	13.2

Answers not mutually exclusive.

Results of Question 17f

TABLE 7: OFFICE AND STORE MACHINERY MANUFACTURERS — SIC 318

Source of Funds for New Technology Spending

Firms by Employment Size	Internal Funds	External Funds
	Percent	Percent
Small (20-99)	100	0
Medium (100-499)	57	43
Large (500+)	100	0
Total Firms	65	35

4.3 Employment to 1995

This section reviews expected trends in employment patterns and outlines the most important factors affecting aggregate industry employment in Ontario.

4.3.1 Factors Affecting Employment

Firms in the industry identify the level of sales in their own industry as the most significant factor affecting employment levels. However, the range of views reported is very broad.

The medium size firms list profitability and overall economic growth as important determinants of employment and lay stress on management's role in creating hiring opportunities.

Large firms' views depart from other opinions by focusing on the ability to compete, in both domestic and foreign markets. They too list sales levels as an important factor, but rank it lower in significance than other firms. The views of respondents are recorded in Table 8.

4.3.2 Employment Outlook

Employment in Ontario in the 1971 to 1981 period averaged 4.0 percent a year. The firms surveyed indicate that the industry expects strong employment growth in 1985 of about 5 percent as the industry accelerates out of the recession (see Table 9). Employment growth is expected to slow slightly with an anticipated rate of 4.0 percent per annum for the 1985 to 1990 period and 3.5 percent per annum for the period 1990 to 1995.

Results of Question 11a,b,c

TABLE 8: OFFICE AND STORE MACHINERY MANUFACTURERS — SIC 318

Most Important Factors Affecting The Firms' Employment in Ontario

Factor		Percent of Firms by Employment Size: Small (20-99)	Medium (100-499)	Large (500+)	Total Firms
PROFITABILITY/ FINANCIAL STRENGTH	First	0	25	0	21
	Second	0	0	0	0
	Third	0	0	0	0
	Weighted Importance (1)	0.0	0.7	0.0	0.6
INCREASE SALES/ INCREASE MARKET SHARE	First	100	25	0	33
	Second	0	25	0	21
	Third	0	0	50	2
	Weighted Importance	3.0	1.0	0.5	1.4
INTRODUCTION OF NEW TECHNOLOGY	First	0	0	0	0
	Second	0	0	0	0
	Third	100	0	0	12
	Weighted Importance	1.0	0.0	0.0	0.1
SUCCESS IN FOREIGN MARKETS	First	0	0	50	2
	Second	0	0	0	0
	Third	0	0	0	0
	Weighted Importance	0.0	0.0	1.5	0.1
PRODUCT DIVERSIFICATION	First	0	0	0	0
	Second	0	0	0	0
	Third	0	50	0	21
	Weighted Importance	0.0	0.2	0.0	0.2
AVAILABILITY OF NECESSARY SKILLS	First	0	0	0	0
	Second	0	25	0	21
	Third	0	0	0	0
	Weighted Importance	0.0	0.5	0.0	0.4
ABILITY TO COMPETE	First	0	0	50	2
	Second	0	0	50	2
	Third	0	0	0	0
	Weighted Importance	0.0	0.0	2.5	0.1
OVERALL ECONOMIC GROWTH	First	0	25	0	21
	Second	0	0	0	0
	Third	0	0	0	0
	Weighted Importance	0.0	0.8	0.0	0.6
ALL OTHERS	First	0	25	0	21
	Second	100	25	0	33
	Third	0	25	0	21
	Weighted Importance	2.0	1.5	0.0	1.4

(1) Weighted Importance = (First % x 3) + (Second % x 2) + (Third % x 1)

Results of Question 11d

TABLE 9: OFFICE AND STORE MACHINERY MANUFACTURERS

SIC 318

Firms' Employment Trends in Ontario

Total Employment and Average Annual Compound Rate of Change (1)

Firms by Employment Size	Estimated Rate 1981-1984	Estimated Rate 1984-1985	Expected Rate 1985-1990	Expected Rate 1990-1995
Small (20-99)	-6.0	-12.0	2.5	0.0
Medium (100-499)	3.5	9.0	5.5	5.0
Large (500+)	2.0	0.0	2.0	1.5
Total Firms	2.5	5.0	4.0	3.5

(1) Rounded to closest 0.5%.

Results of Question 12

TABLE 10: OFFICE AND STORE MACHINERY MANUFACTURERS

SIC 318

Trends in Firms' Occupational Structure

Occupations	Percent of Total Employment by Selected Occupational Categories				
	Estimated			Expected	
	1981	1984	1985	1990	1995
MANAGERIAL, ADMINISTRATIVE AND RELATED	25.4	24.4	24.3	23.1	22.0
NATURAL SCIENCES, ENGINEERING AND MATHEMATICS	19.3	20.7	20.6	21.6	21.6
• Electrical Engineers		0	0	+	0
• All Other Engineers		0	0	0	0
• Engineering Technicians and Technologists		0	0	-	-
• Systems Analysts and Computer Programmers		0	0	+	+
• All Other Science and Mathematics (not listed above)		0	0	0	0
MACHINING	9.2	6.5	6.5	6.4	6.5
• Welding/Soldering		-	0	0	0
• All Other Machining (not listed above)		-	0	0	0
FABRICATING, ASSEMBLING AND REPAIRING	32.0	33.1	32.4	31.7	32.7
• Business and Commercial Machines Fabricating and Assembling		-	-	-	0
• Electronic Equipment Fabricating and Assembling		0	0	0	0
• Inspecting and Testing		0	0	0	0
• Business and Commercial Machine Mechanics and Repairmen		0	+	0	0
• All Other Fabricating, Assembling and Repairing (not listed above)		0	0	0	0
MATERIALS HANDLING AND RELATED	2.3	2.4	2.5	2.5	2.6
ALL OTHER OCCUPATIONS	11.9	12.9	13.7	14.7	14.6
TOTAL	100%	100%	100%	100%	100%

+ increase - decrease 0 no change

Expectations vary widely depending on firm size and within size groups. Small firms expect little growth after 1990 while medium sized firms expect growth per annum of about 5.0 percent. Among the medium firms, growth rates vary between 3 percent and 8 percent for the decade beginning in 1985.

When compared with firms' expectations about constant dollar shipments growth (see Table 5), expected employment growth rates are generally much lower. This may imply that firms expect to benefit from increasing labour productivity due to the introduction of new technology. Also the medium size firms are the most optimistic in their estimates of both shipments and employment.

4.3.3 Trends in Part-Time Work

Part-time work is currently insignificant in the industry, averaging about 2 percent of total employment in 1984. Firms expect little change in this share in the period to 1995.

4.4 Changes in Occupational Structure

Table 10 shows expected trends in firms' occupational structure. Each major occupational group is expressed as a percent of total industry employment by year. Trends over time for minor occupational groups are expressed as: +, increasing share of total employment; -, decreasing share of total employment; and o, no change in share of industry employment. The 1971 Canadian Classification and Dictionary of Occupations was used to classify and describe the occupations outlined in Table 10. Survey respondents were provided with a detailed description of each occupation; however, in some cases, differences in interpretation of the classifications occurred.

Firms foresee stability in shares among the major occupational groups. Managerial and Administrative employees will make up a slightly declining share of employment while the proportion of those in Natural Sciences will increase somewhat in the coming decade. Other major occupational groups will experience little change according to our respondents.

Some respondents do perceive more substantial changes in occupational shares, but others have views offsetting them to a great extent. Trends do not appear to depend on firm size but do appear to some degree in individual occupations. Even so, within groups only very modest changes among occupations are anticipated. The lone exception is the Natural Sciences group, where systems analysts and computer programmers are expected to have an increasing proportion of industry employment, while engineering technicians and technologists will be declining. Otherwise firms expect occupational structure to remain stable during the years to 1995.

5.0 EMPLOYMENT EFFECTS OF NEW TECHNOLOGY

This section reviews the survey results on the employment effects of new technology in terms of skills match and requirements and impact on skill levels and job content.

5.1 Effect on Occupations

Table 11 summarizes firms' views on how technology will affect their occupational requirements as compared with anticipated availability of employees. Generally, a rather high level of 'no response' was forthcoming, which could be interpreted as 'don't know', except in the area of Engineering technicians and technologists where every firm responded.

There is fairly strong consensus that a short supply will occur for the following occupations:

- Engineering technicians and technologists (79%), and
- Business and commercial machinery mechanics and repairmen (62%).

A less significant percentage of firms also indicated a shortage for systems analysts and computer programmers (46%), while 42 percent of the firms anticipate a shortage may occur for:

- Business and commercial machine fabricating and assembling;
- Electronic equipment fabricating and assembling; and
- Inspecting and testing occupations.

Material Handling occupations are expected to be in oversupply by all responding firms, and engineers, welders and solderers anticipate more oversupply than shortage.

Results of Question 6

TABLE 11: OFFICE AND STORE MACHINERY MANUFACTURERS

Impact of Technology on Selected Occupations in Firms 1985-1995

Occupations	Percent of Firms		
	Oversupply	Shortage	No Response
MANAGERIAL, ADMINISTRATIVE AND RELATED	2	23	75
NATURAL SCIENCES, ENGINEERING AND MATHEMATICS			
• Electrical Engineers	42	5	54
• All Other Engineers	42	17	42
• Engineering Technicians and Technologists	21	79	0
• Systems Analysts and Computer Programmers	21	46	33
PROCESSING	0	0	100
MACHINING			
• Welding/Soldering	21	12	67
FABRICATING, ASSEMBLING AND REPAIRING			
• Business and Commercial Machines Fabricating and Assembling	23	42	35
• Electronic Equipment Fabricating and Assembling	23	42	35
• Inspecting and Testing	2	42	58
• Business and Commercial Machine Mechanics and Repairmen	23	62	15
MATERIALS HANDLING AND RELATED	44	0	56
OTHER	0	0	100

Results of Question 7

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TABLE 12: OFFICE AND STORE MACHINERY MANUFACTURING

Steps Firms Will Likely Take to Deal With OVERSUPPLY of Skills 1985-1995

Occupations	Most Commonly Cited	Second Most Common	Third Most Common
MANAGERIAL, ADMINISTRATIVE AND AND RELATED	Attrition	Early Retirement	(1)
NATURAL SCIENCES, ENGINEERING AND MATHEMATICS			
• Electrical Engineers	Retrain	Attrition	(1)
• All Other Engineers	Retrain	Attrition	(1)
• Engineering Technicians and Technologists	Attrition	Early Retirement	(1)
• Systems Analysts and Computer Programmers	Retrain	Layoffs	(1)
MACHINING			
• Welding/Soldering	Layoffs	Retrain	(1)
FABRICATING, ASSEMBLING AND REPAIRING			
• Business and Commercial Machines Fabricating and Assembling	Layoffs	Retrain	(1)
• Electronic Equipment Fabricating and Assembling	Layoffs	Retrain	(1)
• Inspecting and Testing	Retrain	Attrition	(1)
• Business and Commercial Machine Mechanics and Repairmen	Attrition	Early Retirement	Retrain
MATERIALS HANDLING AND RELATED	Retrain	Attrition	Layoffs

(1) Only two steps mentioned.

Results of Question 8

SIC 318

TABLE 13: OFFICE AND STORE MACHINERY MANUFACTURING

Steps Firms Will Likely Take to Deal With SHORTAGE of Skills 1985-1995

Occupations	Most Commonly Cited	Second Most Common	Third Most Common
MANAGERIAL, ADMINISTRATIVE AND AND RELATED	Upgrade	(1)	(1)
NATURAL SCIENCES, ENGINEERING AND MATHEMATICS			
• Electrical Engineers	Recruit	Retrain	Contract Out
• All Other Engineers	Recruit	Retrain	Contract Out
• Engineering Technicians and Technologists	Retrain	Recruit	Contract Out
• Systems Analysts and Computer Programmers	Recruit	Retrain	Contract Out
MACHINING			
• Welding/Soldering	Recruit	(1)	(1)
FABRICATING, ASSEMBLING AND REPAIRING			
• Business and Commercial Machines Fabricating and Assembling	Retrain	Recruit	Upgrade
• Electronic Equipment Fabricating and Assembling	Retrain	Recruit	Upgrade
• Inspecting and Testing	Retrain	Upgrade	Contract Out
• Business and Commercial Machine Mechanics and Repairmen	Contract Out	Retrain	Recruit

(1) Only one step mentioned.

5.2 Likely Steps to Deal with Skills Oversupply

The approach to dealing with oversupply varies by occupation. Positions which demand a relatively high level of education, namely those in the Managerial and Natural Sciences groups, will adjust primarily through retraining and attrition and secondarily through early retirement.

In contrast those occupations associated with lower educational levels are expected to adjust primarily through layoffs and retraining and secondarily through attrition. Table 12 presents the details of respondents' views.

5.3 Likely Steps to Deal with Skills Shortages

Recruiting and retraining are expected to be the most widely used approaches to overcoming shortages of employees. These are followed by contracting out, of which this industry expects to make widespread use in the coming decade. This applies not only in Science and Engineering but also in Fabricating, Assembling and Repairing (see Table 13).

5.4 Technology Impact on Skill Levels and Job Content

Respondents were asked to judge the expected impact of new technology on each occupation in terms of:

- skills required,
- time required to achieve proficiency, and
- knowledge of their firms' operations.

Table 14 records respondents' views.

In all but one occupation, changing technology is expected, by a majority of respondents to require increasing skills of

Results of Question 9

TABLE 14: OFFICE AND STORE MACHINERY MANUFACTURERS — SIC 318

Impact of Technology on Skill Levels and Job Content

(1) Percent of Firms

Occupations	Skills Required			Time to Achieve Proficiency			Knowledge of Firm's Operations		
	+	-	0	+	-	0	+	-	0
MANAGERIAL, ADMINISTRATIVE AND RELATED	88	0	12	21	23	56	56	0	44
NATURAL SCIENCES, ENGINEERING AND MATHEMATICS									
• Engineers	95	0	5	95	0	5	50	0	50
• All Other Engineers	82	0	18	29	26	45	71	0	29
• Engineering Technicians and Technologists	85	0	15	65	21	15	77	0	23
• Systems Analysts and Computer Programmers	65	31	4	34	31	34	66	0	34
MACHINING	39	39	23	0	39	61	100	0	0
FABRICATING, ASSEMBLING AND REPAIRING									
• Business and Commercial Machines Fabricating and Assembling	55	26	19	3	26	71	68	0	32
• Electronic Equipment Fabricating and Assembling	74	24	3	3	47	50	71	0	29
• Inspecting and Testing	74	0	26	24	3	74	94	0	6
• Business and Commercial Machine Mechanics and Repairmen	81	3	16	54	3	43	70	0	30
MATERIALS HANDLING AND RELATED	55	26	19	29	26	45	70	0	30

\+ increase - decrease 0 remain the same

(1) Non-responses excluded.

employees. Views on future skills required for welders and solderers are evenly split between more and less. Increased skills are especially expected for the Natural Sciences, Engineering and Mathematics, and Fabricating, Assembling and Repairing occupations.

The effect of new technology introduction on time required to achieve proficiency depends on occupation. Only for electronic equipment fabricators is time saving expected to offset the likely increase in skill requirements. Respondents feel that, on balance, some time saving is possible for other occupations such as welding, but, that no time saving is the most likely outcome. The survey also identifies four occupations as likely candidates for a time requirement increase - electrical engineering, engineering technicians, inspecting and testing and mechanics and repairmen for business and commercial machinery. On average, considering all occupations together, the industry expects time requirements to remain about the same.

Firms clearly expect their employees to become better informed about company operations than previously if they are to make proper use of new technology being introduced. These views apply for a majority of respondents with respect to all occupations except electrical engineers, where the views were equally split between the need for more knowledge and no change in knowledge required.

5.5 Training Costs and New Technology

Expenditures to train staff are expected to increase more rapidly than total labour costs in the years to 1995. From an estimated 1981 level of about 4.0 percent they are projected to rise to the 9.5 percent range by 1995. Medium size firms anticipate spending proportionately more than others on training and their outlays will be responsible for most of the industry's increases.

Training costs related to new technology are expected to be an increasing proportion of total training costs in the 1985 to 1995 period. Here again, expenditure levels on new technology vary widely. Small firms expect to lay out very little related to new technology while large firms spend a greater share now and except to increase this share in the future. For 1981, an estimated 40 percent of training costs was related to new technology and the expectation is an increase to 50 percent by 1990 and maintained at that level through 1995.

6.0 LABOUR RELATIONS ENVIRONMENT

This chapter discusses the labour relations environment in the industry.

6.1 Industrial Relations Environment: Historical

In the Office and Store Machinery Industry in Ontario only 2.4 percent of the 10,485 employees are unionized. The major unions, as shown in Table 15, are the United Auto Workers representing 32 percent of the total 255 unionized employees and the Graphic Communications Union, representing a further 30 percent. There are an additional five unions each representing less than 25 people, ranked in decreasing order:

- Teamsters,
- Machinists,
- Molders,
- National Council of Canadian Labour,
- United Steelworkers.

The major employers with union agreements are Burroughs Canada located in Scarborough and National Cash Register of Canada Ltd. in Rexdale and Mississauga.

6.2 Trends in Unionization

The survey estimates that 23 percent of firms in the industry have some degree of unionization. In those firms with union representation about 19 percent of the work force is estimated to be unionized. The survey respondents expect a steady decrease in this percentage to 1995 when they estimate unionized employment will be 14 percent of the work force in these firms.

TABLE 15

INDUSTRIAL RELATIONS: OFFICE, STORE AND BUSINESS MACHINE MANUFACTURERS

UNION	NUMBER OF MEMBERS	MAJOR EMPLOYER	LOCATION
UNITED AUTO WORKERS	60	Burroughs Canada	Scarborough
	22	AM International Inc.	Scarborough
GRAPHIC COMMUNICATIONS	77	NCR Canada Ltd.	Rexdale and Mississauga
TEAMSTERS	25	VS Services Ltd., Vending Service Centre	Toronto
MACHINISTS	16	Reliance Electric of Toledo Ltd., Scale Division	Windsor
	8	Reliance Electric of Toledo Ltd., Scale Division	Windsor
MOLDERS	20	Canadian Scale Co. Ltd.	Etobicoke
NATIONAL COUNCIL OF CANADIAN LABOUR	15	NCR Canada Ltd.	Etobicoke
UNITED STEELWORKERS	12	Olivetti Canada Ltd., Manufacturing Division	North York

* Only applies to agreements affecting 200 employees or more.

SOURCE: Collective Bargaining Agreement Systems, Ontario Ministry of Labour.

6.3 Technology Change Clauses

None of the survey respondents reported having a technology change clause. This information parallels that of the Ontario Ministry of Labour which has no record of technology change clauses because no union agreement in the industry affects 200 employees or more.

6.4 Management's Perception of their Union's Position on New Technology

Respondents provided no information on this subject for this industry.

6.5 Nature of Worker Involvement in the Process of Technological Change

Firms were asked whether they had a formal mechanism for worker participation in setting production and/or sales targets, improving productivity and/or quality and adopting new technology.

Despite the absence of collective bargaining agreements in the industry, formal mechanisms are widespread at all levels regardless of firm size. With respect to production targets, the level of involvement in these mechanisms does not change much in moving from company to working group level. This does not imply that some firms have such mechanisms and some do not. Among the medium firms (100 to 499 employees), for example, some have them at upper levels only, while some restrict such mechanisms to the working group or department level. The small firms reporting indicated having a mechanism for working involvement at the company level only.

Formal mechanisms exist for setting production or sales targets in 50 to 66 percent of the industry. Productivity and quality is the subject of formal consultation in 79 percent of the industry, while new technology adoption is discussed by 65 percent, indicating that consultation on these subjects is slightly more widespread than in the setting of production targets.

6.6 Views on Involving Workers in Decisions on Adopting New Technology

Management was asked how workers should be involved in decisions regarding the adoption of new technology. Respondents tend to view the process of technological change as a normal aspect of the business, not as a new challenge in the 1980's bringing changes to traditional business methods. Ongoing change in the past has made them cognizant of the need to retrain and upgrade employees on a regular basis and, most importantly, to keep them informed about coming changes. They also recognize the benefits of consulting with employees on future developments so as to be better informed about ways to improve productivity. Familiarity with equipment, they say, produces an awareness of how this equipment needs to be improved. Listening to employee views thus produces the impetus for future technological change.

7.0 PLANNING FOR TECHNOLOGICAL CHANGE

This chapter reports survey results regarding questions related to planning for technological change. A summary of these results appears in Table 16.

The survey indicates that about 58 percent of the industry makes use of strategic planning. Small and large firms appear to do so more than medium. The picture is similar with regard to human resource plans and capital investment plans, although fewer medium size firms have a formal capital investment plan to deal with new technology (only 25 percent) than have human resource plans.

Firms appear to have a longer planning horizon for human resources related to new technology (5 years) than for capital investment (3 years). This is somewhat unusual since the level of fixed assets is normally relatively more difficult to change and update than that of human resources. This may not be the case where ability to take advantage of new technology is an important component of employment.

The planning horizon seems to shorten as firm size increases. However, degree of integration between plans appears to increase along with firm size.

Results of Question 18

TABLE 16: OFFICE AND STORE MACHINERY MANUFACTURERS

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Planning for Technological Change

Firms by Employment Size	Strategic Plan	Human Resource Plan		Capital Investment Plan		Perceived Integration Between Capital and Human Plans (1)
	Percent of Firms With Plan	Percent of Firms With Plan	Length of Planning Horizon	Percent of Firms With Plan	Length of Planning Horizon	
Small (20-99)	100	100	6 years	100	6 years	1.0
Medium (100-499)	50	50	5 years	25	2 years	2.7
Large (500+)	100	100	4 years	100	3 years	5.0
Total Firms	58	58	5 years	36	3 years	2.5

1. Using a scale of 1 to 5; 1 represents "Not at all integrated" and 5 "Highly integrated".

PART IV - APPENDICES

Part IV of this report presents the appendices referred to in Parts I to III.

These appendices are:

Appendix	Title	Reference
A	Firm Employment Size Categories Used in the Survey of the Iron and Steel Industry	Part I
B	Questionnaire and Responses by Question	Part I Part III
C	Reliability of the Sample	Part I
D	Historical Tables	Part II

APPENDIX A

FIRM EMPLOYMENT SIZE CATEGORIES USED IN THE SURVEY OF THE OFFICE, STORE AND BUSINESS MACHINE INDUSTRY

APPENDIX A

FIRM EMPLOYMENT SIZE CATEGORIES USED IN THE SURVEY OF THE OFFICE, STORE AND BUSINESS MACHINE INDUSTRY

Size Categories Used to Stratify the Sample Frame	Size Categories Used to Weight and Report Survey Results	
Number of Employees		Number of Employees
20 - 49	Small	20 - 99
50 - 99		
100 - 199	Medium	100 - 499
200 - 499		
500 - 999	Large	500 or more
1000 - 1499		
1500 - 2499		
2500 - 4999		
5000 or more		

APPENDIX B

QUESTIONNAIRE

AND

RESPONSES BY QUESTION

ONTARIO TASK FORCE ON EMPLOYMENT AND NEW TECHNOLOGY

OFFICE, STORE & BUSINESS MACHINERY
(SIC 318)
QUESTIONNAIRE

Currie, Coopers & Lybrand
Management Consultants

INTRODUCTION

Thank you for agreeing to participate in the study. It is being carried out for the Ontario Task Force on Employment and New Technology, a joint labour-management group. Their mandate is to examine the extent and nature of employment change likely to result from the introduction and application of new technology in Ontario over the next ten years.

You Will Receive The Survey Results
As a participant, you will receive a report on the survey results for your industry.

All Responses Will Be Confidential
All responses will be held in strictest confidence. Responses will be analysed and used only at an industry-wide level.

Both Organized Labour and Management Are Being Surveyed
Management and organized labour participants, in the case of unionized firms, will both receive a questionnaire. We realize that labour participants may not be able to answer some of the questions. In particular, they may find difficulty in answering questions: 10, 11, 12, 13 and 17.

Participants May Want to Consult Key Resource People in Responding
The questionnaire is not necessarily meant to be completed by only one respondent. It may be appropriate and even desirable for survey participants to consult other key resource people in their firm before responding to the questionnaire. Respondents should indicate on the Participant Information (p.4), the "principle respondent" and "other respondents" as well as the Section(s) of the questionnaire to which they contributed.

You Will Save Time if Information is Filled in Before the Interview
A number of questions relate to your firm's past or present workforce and future plans. We are requesting management respondents to provide accurate information from their organization's records in advance of the interview. This step will reduce the time needed for the actual interview and also make it more meaningful. The Participant Information (p.4) and the following questions should be filled in prior to the management interview: 3, 6 to 13 inclusive, 15 and 17.

Group Interviews Are Possible
In some cases the principle respondent may want to arrange a group interview between himself, key resource people and our consultant. We would welcome such an arrangement. This option is open to either management or labour participants.

You May Wish to Complete the Entire Questionnaire Before the Interview
The entire questionnaire could be completed in advance of the interview. If this is convenient, please do so. We would, however, still wish to spend a half-hour with you to review your responses.

Your "Best" Estimate
Where estimates are required, we are asking respondents to provide us with their "best estimate". Estimating future trends is difficult. Our premise is that an expert inside the organization is in the best position to make them, based on his or her knowledge of the firm's future direction.

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EXHIBIT A

SELECTED OCCUPATIONS: OFFICE, STORE & BUSINESS MACHINERY, SIC 318

MANAGERIAL, ADMINISTRATIVE & RELATED (includes senior and middle management and administrative support functions such as personnel officers, financial officers).

NATURAL SCIENCE, ENGINEERING & MATHEMATICS

Electrical Engineers.
All Other Engineers.
Engineering Technicians & Technologists.
Systems Analysts & Computer Programmers.

PROCESSING (includes materials processing occupations such as in metal processing: refining, smelting, heat treating, rolling, moulding, casting, extruding, plating, testing and inspecting).

MACHINING

Welding/Soldering

FABRICATING, ASSEMBLING & REPAIRING

Business & Commercial Machines Fabricating & Assembling.
Electronic Equipment Fabricating & Assembling.
Inspecting & Testing.
Business & Commercial Machine Mechanics & Repairmen.

MATERIAL HANDLING & RELATED (includes such occupations as hoisting, material handling equipment operators and packaging).

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The Study is Focusing on Selected Occupations

The Task Force for your industry is focusing on chosen major occupational groups and selected occupations within these major groups. These are listed in Exhibit A. The job titles and definitions being used are from the "Canadian Classification and Dictionary of Occupations, 1971" (CCDO). The CCDO is a universal system of job titles and descriptions. Our consultants are available to assist you or your staff in clarifying which of your firm's positions should be considered in the CCDO titles listed in Exhibit A.

Please Call If You Have Any Enquiries

Should you or your staff require any assistance, please call Sandra Skivsky of our firm or the consultant who will be interviewing you, at 366-1921.

Your Participation Is Appreciated

While we appreciate that your participation in the survey puts a demand on your time and organization, we would emphasize that your contribution will have an important impact on the results of this project.

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PARTICIPANT INFORMATION

COMPANY NAME: _____

UNION NAME (if appropriate): _____

AFFILIATED ORGANIZATIONS: _____

MAIN ADDRESS: _____

TELEPHONE NUMBER: ( ) _____

BRIEF DESCRIPTION OF OPERATION IN ONTARIO

Divisions/Branches/Affiliates	Products/Services
_____	_____
_____	_____
_____	_____
_____	_____

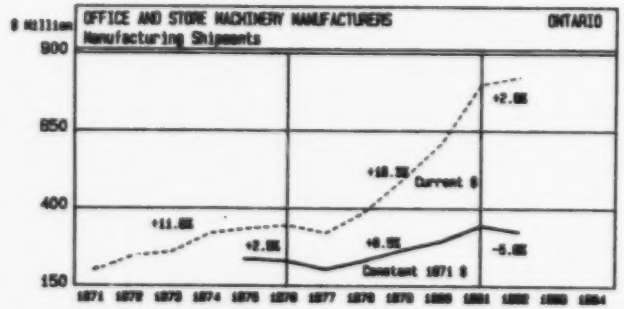
SURVEY PARTICIPANTS

Names	Position	Number of Years With Company	Number of Years With Industry	Check (✓) Sections Answered II	III	IV	V	VI	VII
_____	_____	_____	_____	☐	☐	☐	☐	☐	☐
(principal respondent)									
_____	_____	_____	_____	☐	☐	☐	☐	☐	☐
(other respondents)									
_____	_____	_____	_____	☐	☐	☐	☐	☐	☐
_____	_____	_____	_____	☐	☐	☐	☐	☐	☐
_____	_____	_____	_____	☐	☐	☐	☐	☐	☐

(SIC 318)

CHART 1

INDUSTRY-WIDE MANUFACTURING SHIPMENTS IN ONTARIO*



* Source: Statistics Canada, Manufacturing Industries of Canada: National and Provincial Areas, Cat. No. 31-203. Graph, constant dollar calculation and rates of change by Economics Practice, Currie, Coopers & Lybrand.

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1. INDUSTRY-WIDE MANUFACTURING SHIPMENTS IN ONTARIO

Chart 1, opposite, illustrates manufacturing shipments for the Office, Store & Business Machinery Industry in ONTARIO in current dollars (dotted line) and in constant dollars (current dollars adjusted for price changes-solid line).

The rates shown for the first three time periods listed below are expressed in annual compound rates of change (in constant dollars).

Using these rates as a guide, please estimate the annual compound rates of change (in constant dollars) of your industry's value of manufacturing shipments in Ontario for the next five periods listed.

Manufacturing Shipments in Ontario	Annual Compound Rate of Change (in constant dollars)
1971 to 1976	+2.9 %
1976 to 1981	+8.5 %
1981 to 1982	-5.8 %
	Your Estimates (Indicate if + or -)
1982 to 1983?	___ %
1983 to 1984?	___ %
1984 to 1985?	___ %
1985 to 1990?	___ %
1991 to 1995?	___ %

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2. INDUSTRY-WIDE OUTLOOK - EMPLOYMENT IN ONTARIO

The table below indicates total employment and annual compound rates of change for employment in the Office, Business & Store Machinery Industry in ONTARIO between 1971 and 1982. (Statistics Canada, Cat. No. 31-203).

Would you please indicate your estimates for the five following periods listed below (i.e., 1983-1995). Provide your estimates in actual numbers or in annual compound rates of change, whichever is easier.

For your information, total employment covers full-time, part-time, temporary, casual and contract - i.e., total "head count".

Total Employment in Ontario		Annual Compound Rates of Change	
1971	6,878		
1981	10 176	1971-1981	+4.0 %
1982	10,485	1981-1982	+3.0 %

Your Estimates:

				(Indicate if + or -)
1983?	_____	OR	1982-1983?	___ %
1984?	_____	OR	1983-1984?	___ %
1985?	_____	OR	1984-1985?	___ %
1990?	_____	OR	1985-1990?	___ %
1995?	_____	OR	1990-1995?	___ %

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1. FIRM'S ADOPTION OF TECHNOLOGIES

The following questions refer to new technologies your firm has already or may adopt over the next ten years in ONTARIO.

3a. Please indicate the technologies that have already been adopted by your firm. Record your answer on Chart 3, opposite, under column 3a.

3b. Please indicate the technologies that will probably be adopted by your firm between 1985 and 1990. Record your answer on Chart 3, under column 3b. It may be appropriate to check more than one time period.

3c. Please indicate the technologies that will probably be adopted by your firm between 1991 and 1995. Record your answer on Chart 3, under column 3c. It may be appropriate to check more than one time period.

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CHART 3

TECHNOLOGIES ADOPTED OR TO BE ADOPTED BY THE FIRM

	3a ADOPTED IN 1984 OR BEFORE	3b WILL BE ADOPTED BETWEEN 1985-1990?	3c WILL BE ADOPTED BETWEEN 1991-1995?
1. PRODUCT TECHNOLOGIES			
With Installed Microprocessors	☐	☐	☐
Multifunctional Machines	☐	☐	☐
Any Others? _____	☐	☐	☐
_____	☐	☐	☐
2. DESIGN TECHNOLOGIES			
Computer-Aided Design (CAD)	☐	☐	☐
Computer-Aided Engineering (CAE)	☐	☐	☐
CAD/CAM Integration	☐	☐	☐
Any Others? _____	☐	☐	☐
_____	☐	☐	☐
3. MANUFACTURING PLANNING & CONTROL SYSTEMS			
Computerized Financial Systems	☐	☐	☐
Computerized Order Entry/Inventory Control	☐	☐	☐
Computer-Aided Process Planning	☐	☐	☐
Manufacturing Resource Planning Systems (MRP)	☐	☐	☐
Automated Shop Floor Data Collection	☐	☐	☐
Computerized Decision Support Systems	☐	☐	☐
Computerized Maintenance Planning & Control	☐	☐	☐
Any Others? _____	☐	☐	☐
_____	☐	☐	☐
4. MANUFACTURING PROCESS TECHNOLOGIES			
Computerized Process Control Systems	☐	☐	☐
Computer-Aided Inspection & Testing	☐	☐	☐
Robotic Applications	☐	☐	☐
Flexible Manufacturing Technologies	☐	☐	☐
Computer Integrated Manufacturing (CIM)	☐	☐	☐
Any Others? _____	☐	☐	☐
_____	☐	☐	☐
5. MATERIALS HANDLING TECHNOLOGIES			
Automatic Bulk Handlers/Feeder Systems	☐	☐	☐
Automated Conveyor/Vehicle Systems	☐	☐	☐
Automated Storage & Retrieval	☐	☐	☐
Computer Controlled Conveyor/Vehicles	☐	☐	☐
Automated Warehouses	☐	☐	☐
Any Others? _____	☐	☐	☐
_____	☐	☐	☐
6. TELECOMMUNICATIONS TECHNOLOGIES			
Facsimile (FAX) Link: HO/Plants	☐	☐	☐
Computer Link: HO/Plant(s)	☐	☐	☐
Computer Link: Suppliers/Customers	☐	☐	☐
Any Others? _____	☐	☐	☐
_____	☐	☐	☐
7. OTHER TECHNOLOGIES			
_____	☐	☐	☐
_____	☐	☐	☐
DOES/WILL NOT ADOPT ANY NEW TECHNOLOGIES IN THIS PERIOD	☐	☐	☐

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4. FORCES DRIVING THE FIRM'S NEED FOR NEW TECHNOLOGIES OVER THE NEXT 10 YEARS

4a. What is the **single most important driving factor** in your firm's internal or external environment which could accelerate your **firm's need to adopt** these new technologies over the next 10 years in ONTARIO?

4b. What is the **second most important factor** likely to accelerate your firm's need to adopt these new technologies?

4c. And what is the **third most important factor**?

5. FACTORS AFFECTING THE FIRM'S RATE OF TECHNOLOGY ADOPTION OVER THE NEXT 10 YEARS

5a. What is the **single most important factor** in your firm's internal or external environment that could <u>slow down</u> the **speed** at which your firm will adopt these new technologies over the next 10 years in ONTARIO?

5b. What is the **second most important** factor that could slow down your firm's adoption of these new technologies?

5c. And what is the **third most important factor**?

6. IMPACT OF TECHNOLOGY ON OCCUPATIONS OVER THE NEXT 10 YEARS

The following questions attempt to determine impacts on specific occupations you expect to be caused by the adoption of new technologies in your firm over the next 10 years in ONTARIO.

6a. Please indicate the **occupations** in which your firm is likely to have an **oversupply of people** over the next 10 years as a result of the adoption of these new technologies. Record your answer on Chart 6, opposite, under column 6A.

6b. Please indicate the **occupations** in which you expect your firm will have a **shortage of the skills** required to cope with these new technologies. Record your answer on Chart 6, under column 6B.

(SIC 318)

CHART 6
IMPACT OF TECHNOLOGIES ON SELECTED OCCUPATIONS
IN YOUR FIRM OVER THE NEXT 10 YEARS

	6a OCCUPATIONS WITH AN OVERSUPPLY OF SKILLS	6b OCCUPATIONS WITH A SHORTAGE OF THE REQUIRED SKILLS
MANAGERIAL, ADMINISTRATIVE & RELATED	☐	☐
NATURAL SCIENCE, ENGINEERING & MATHEMATICS		
• Electrical Engineers	☐	☐
• All Other Engineers	☐	☐
• Engineering Technicians & Technologists	☐	☐
• Systems Analysts & Computer Programmers	☐	☐
PROCESSING	☐	☐
MACHINING		
• Welding/Soldering	☐	☐
FABRICATING, ASSEMBLING & REPAIRING		
• Business & Commercial Machines Fabricating & Assembling	☐	☐
• Electronic Equipment Fabricating & Assembling	☐	☐
• Inspecting & Testing	☐	☐
• Business & Commercial Machine Mechanics & Repairmen	☐	☐
MATERIAL HANDLING AND RELATED	☐	☐
ANY OTHER OCCUPATIONS SIGNIFICANTLY AFFECTED? WHICH ONES?		
_____	☐	☐
_____	☐	☐
_____	☐	☐

7. ACTIONS TO DEAL WITH OVERSUPPLY OF SKILLS IN FIRM OVER NEXT 10 YEARS

The following questions relate to the actions your firm will likely take to deal with the oversupply of people in your firm resulting from the adoption of these new technologies in ONTARIO.

7a. For each occupation with a potential oversupply of skills (as you indicated in Q.6a), please identify the **steps** your firm will likely take that will **affect the largest number of people** in that occupation. Record your answers on Chart 7, opposite, under column 7a.

In answering this and the following question, please consider the possible actions listed below as well as any other possible action not in the list but that your firm is likely to take.

Possible Actions

- Attrition
- Early Retirement
- Layoffs
- Relocation (geographic)
- Shorter hours/work week
- Job sharing
- Change from full-time to part-time
- Retraining
- Lateral transfer
- Upgrading
- Downgrading
- Etc. etc.,

7b. Again, for each of these occupations, identify the step your firm may take that will affect the **second largest number of people** in that occupation. Record on Chart 7, under column 7b.

(SIC 318)

CHART 7

STEPS FIRM WILL LIKELY TAKE
TO DEAL WITH OVERSUPPLY OF SKILLS OVER NEXT 10 YEARS

OCCUPATIONS	7a STEPS THAT WILL AFFECT THE LARGEST NUMBER OF PEOPLE IN THIS OCCUPATION	7b STEPS THAT WILL AFFECT THE 2ND LARGEST NUMBER OF PEOPLE IN THIS OCCUPATION
MANAGERIAL, ADMINISTRATIVE & RELATED		
NATURAL SCIENCE, ENGINEERING & MATHEMATICS		
• Electrical Engineers		
• All Other Engineers		
• Engineering Technicians & Technologists		
• Systems Analysts & Computer Programmers		
PROCESSING		
MACHINING		
• Welding/Soldering		
FABRICATING, ASSEMBLING & REPAIRING		
• Business & Commercial Machines Fabricating & Assembling		
• Electronic Equipment Fabricating & Assembling		
• Inspecting & Testing		
• Business & Commercial Machine Mechanics & Repairmen		
MATERIAL HANDLING AND RELATED		
ANY OTHER OCCUPATIONS SIGNIFICANTLY AFFECTED? WHICH ONES?		
_____		
_____		
_____		

(SIC 318)

8. STEPS TO ACQUIRE THE NEW SKILL REQUIREMENTS OVER THE NEXT 10 YEARS

The following questions are intended to identify the most likely steps your firm may take to acquire the new skill requirements associated with the new technologies over the next 10 years in ONTARIO.

8a. Please indicate, for each occupation with a potential shortage of the new skill requirements (as you indicated in Q6b), the step your firm will likely take that will affect the largest number of people in that occupation. Record your answers on Chart 8, column 8a.

Please consider the possible actions listed below as well as any other action (not listed) that your firm is likely to take.

Likely Steps

- Retraining
- Relocation
- Upgrading
- Increased overtime of firm's skilled people
- Recruiting full-time skilled people
- Recruiting part-time skilled people
- Contracting work out
- Etc., etc...

8b. Please indicate, for each occupation, the step your firm may take that will affect the second largest number of people in that occupation. Record your answers in column 8b.

(SIC 318)

CHART 8

STEPS FIRM WILL TAKE
OVER NEXT 10 YEARS TO ACQUIRE THE NEW SKILL REQUIREMENTS

OCCUPATIONS	8a STEP WHICH WILL AFFECT THE LARGEST NUMBER OF PEOPLE IN THIS OCCUPATION	8b STEP WHICH WILL AFFECT THE 2ND LARGEST NUMBER OF PEOPLE IN THIS OCCUPATION
MANAGERIAL, ADMINISTRATIVE & RELATED		
NATURAL SCIENCE, ENGINEERING & MATHEMATICS		
• Electrical Engineers		
• All Other Engineers		
• Engineering Technicians & Technologists		
• Systems Analysts & Computer Programmers		
PROCESSING		
MACHINING		
• Welding/Soldering		
FABRICATING, ASSEMBLING & REPAIRING		
• Business & Commercial Machines Fabricating & Assembling		
• Electronic Equipment Fabricating & Assembly		
• Inspecting & Testing		
• Business & Commercial Machine Mechanics & Repairmen		
MATERIAL HANDLING AND RELATED		
ANY OTHER OCCUPATIONS SIGNIFICANTLY AFFECTED? WHICH ONES?		
_____		
_____		
_____		

(SIC 318)

9. NATURE OF IMPACT ON SKILLS AND JOB CONTENT OVER THE NEXT TEN YEARS

The following questions are meant to identify the nature of the impact on selected occupations in ONTARIO.

9a. For selected occupations in your firm, please indicate how the new technologies will affect each in their daily work. That is, will their daily work require greater skill (+), less skill (-), or about the same skill (0) as they currently require. Record your answers on Chart 9, opposite, under Column 9a.

9b. Please indicate whether the new skills they require will demand more time (+), less time (-), or about the same time (0) to achieve the proficiency that they will need. Record your answers on Chart 9, column 9b.

9c. Please indicate whether, in using these new technologies, these occupations will require more knowledge (+) of the company's operations, less knowledge (-), or about the same (0) amount of knowledge as is currently required to perform their daily tasks. Record your answers on Chart 9, under 9c.

CHART 9

IMPACT OF TECHNOLOGY ON SKILL LEVELS AND JOB CONTENT

	9a SKILLS REQUIRED (+, -, 0)	9b TIME TO ACHIEVE PROFICIENCY (+, -, 0)	9c KNOWLEDGE OF COMPANY'S OPERATIONS (+, -, 0)	COMMENTS
MANAGERIAL, ADMINISTRATIVE & RELATED	___	___	___	_____
NATURAL SCIENCE, ENGINEERING & MATHEMATICS				
• Electrical Engineers	___	___	___	_____
• All Other Engineers	___	___	___	_____
• Engineering Technicians & Technologists	___	___	___	_____
• Systems Analysts & Computer Programmers	___	___	___	_____
PROCESSING	___	___	___	_____
MACHINING				
• Welding/Soldering	___	___	___	_____
FABRICATING, ASSEMBLING & REPAIRING				
• Business & Commercial Machines Fabricating & Assembling	___	___	___	_____
• Electronic Equipment Fabricating & Assembling	___	___	___	_____
• Inspecting & Testing	___	___	___	_____
• Business & Commercial Machin Mechanics & Repairmen	___	___	___	_____
MATERIAL HANDLING AND RELATED	___	___	___	_____
AN OTHER OCCUPATIONS SI NIFICANTLY AFFECTED? WHICH ONES?				
_____	___	___	___	_____
_____	___	___	___	_____
_____	___	___	___	_____

(SIC 318)

10. TRAINING/RETRAINING

These questions are about the current and future importance of **training and retraining** in your organization.

10a. Please indicate what were your firm's total training costs as a percent of total labour costs in **1981**. Record your answer on Chart 10, line 10a.

Training costs include the costs of internally or externally provided training programs, classroom and on-the-job workshops, vouchers or tuition credits, provided by your firm, which are intended to train employees to perform their jobs or to retrain employees to assume new or alternate jobs. Labour costs include all wages, salaries and benefits. (e.g., $\frac{\text{Total Training Costs}}{\text{Total Labour Costs}} \times 100 = 1.0\%$)

10b. Please indicate what your firm's total training costs as a percent of total labour costs will be in **1984** (to year end). Record your answer on line 10b.

10c. What do you estimate for **1985**, (line 10c)?

10d. What do you estimate it will be in **1990**, (line 10d)?

10e. What do you estimate it will be in **1995**, (line 10e)?

10f. For each year on Chart 10, (line 10a to 10e), please indicate what percent of total training costs in each year have or will go towards training people to adapt to the new technologies.

CHART 10

TRAINING COSTS OF FIRM

			As a Percent of Total Labour Costs	Percent of Total Training Costs Directly Related to New Technologies
10a.	1981?	Actual	___%	___%
10b.	1984?	Estimate	___%	___%
10c.	1985?	Estimate	___%	___%
10d.	1990?	Estimate	___%	___%
10e.	1995?	Estimate	___%	___%

(SIC 318)

(SIC 318)

11. FIRM'S EMPLOYMENT TRENDS

In this section, we would like to determine how the firm's employment levels in ONTARIO are likely to change over the next 10 years.

11a. To begin, considering all possible factors in your firm's internal and external environment, what is the **single most important factor** which will have an impact on your firm's level of employment in ONTARIO over the next 10 years? _____

_____

11b. The **second most important factor**? _____

_____

11c. The **third most important factor**? _____

_____

11d. Please indicate total **employees** (includes full-time, temporary, contract, casual, seasonal and part-time employment) in your organization in ONTARIO for **1971, 1981 and 1984** from your employment records. Record your answers on Chart 11, column 11d.

Please estimate future total employment in your organization in ONTARIO for **1985, 1990 and 1995.**

11e. Please indicate the **percent** of your total employment in ONTARIO that are **part-time** employees (i.e., less than normal full work week), for **1981 and 1984.** Record your answers on Chart 11, column 11e.

Also in column 11e, please estimate part-time employees as a percent of total employees in ONTARIO for **1985, 1990 and 1995**

11f. Please translate your total ONTARIO employment (include full-time, part-time, casual, temporary, seasonal) into a full-time equivalent (**F.T.E.**) figure for your firm for **1981 and 1984** in column 11f.

Also in column 11f, please estimate total employment in terms of a full-time equivalent (F.T.E.) for **1985, 1990 and 1995.**

By **F.T.E.** we mean a normal, full, work week for a normal, full year. F.T.E. can be measured in a variety of ways depending on whatever is normal for your firm or industry. For example, if expressed in hours of work per year one FTE might range from 1750 to 2000 hours of work a year depending on the length of the normal work week (e.g., 35 hours/week x 50 weeks = 1750 hours, 40 hours/week x 50 weeks = 2000 hours.)

CHART 11

FIRM'S EMPLOYMENT TRENDS IN ONTARIO

	11d TOTAL EMPLOYMENT IN ONTARIO	11e PART-TIME EMPLOYEES AS A % OF TOTAL EMPLOYMENT	11f TOTAL EMPLOYMENT IN FULL-TIME EQUIVALENT (F.T.E.)
Actual Figures			
1971?	_____		
1981?	_____	_____ %	_____ FTE
1984?	_____	_____ %	_____ FTE
Your Estimates			
1985?	_____	_____ %	_____ FTE
1990?	_____	_____ %	_____ FTE
1995?	_____	_____ %	_____ FTE

12. CHANGES IN EMPLOYMENT STRUCTURE

This section is intended to measure the changes in the employment structure of your firm in ONTARIO between 1981 and 1995.

12a. Please indicate the actual percentage share of <u>each</u> occupation listed as a percent of your firm's total employment in ONTARIO in 1981. Record your answer on Chart 12, column 12a.

12b. Please indicate the actual percentage share of <u>each</u> selected occupation listed as a percent of your firm's total employment in ONTARIO in 1984. Record your answer in column 12b.

12c. Please estimate the same for each selected occupation in 1985. Record in column 12c.

12d. Please estimate the same for each selected occupation in 1990. Record in column 12d.

12e. Please estimate the same for each selected occupation in 1995. Record in column 12e.

(SIC 318)

CHART 12

TRENDS IN FIRM'S OCCUPATIONAL STRUCTURE BETWEEN 1981 AND 1995

	OCCUPATIONS AS A PERCENT OF TOTAL EMPLOYMENT OF THE FIRM IN ONTARIO					
	12a Actual 1981	12b Actual 1984	12c Estimate 1985	12d Estimate 1990	12e Estimate 1995	
	%	%	%	%	%	
MANAGERIAL, ADMINISTRATIVE, & RELATED	☐	☐	☐	☐	☐	1a
NATURAL SCIENCE, ENGINEERING & MATHEMATICS	☐	☐	☐	☐	☐	2a
• Electrical Engineers	___	___	___	___	___	
• All Other Engineers	___	___	___	___	___	
• Engineering Technicians & Technologists	___	___	___	___	___	
• Systems Analysts & Computer Programmers	___	___	___	___	___	
• All Other Science & Mathematics (not listed above)	___	___	___	___	___	
PROCESSING	☐	☐	☐	☐	☐	3a
MACHINING	☐	☐	☐	☐	☐	4a
• Welding/Soldering	___	___	___	___	___	
• All Other Machining (not listed above)	___	___	___	___	___	
FABRICATING, ASSEMBLING & REPAIRING	☐	☐	☐	☐	☐	5a
• Business & Commercial Machines Fabricating & Assembling	___	___	___	___	___	
• Electronic Equipment Fabricating & Assembling	___	___	___	___	___	
• Inspecting & Testing	___	___	___	___	___	
• Business & Commercial Machine Mechanics & Repairmen	___	___	___	___	___	
• All Other Fabricating, Assembling, & Repair (not listed above)	___	___	___	___	___	
MATERIAL HANDLING AND RELATED	☐	☐	☐	☐	☐	6a
ALL OTHER OCCUPATIONS	☐	☐	☐	☐	☐	7a
• **FIRM'S TOTAL EMPLOYMENT IN ONTARIO** (1+2+3+4+5+6+7 = 100%)	100%	100%	100%	100%	100%	

(SIC 318)

13. EMPLOYMENT STRUCTURE BY SEX

The following questions refer to your firm's employment in ONTARIO **by sex** for each specific occupation listed in Chart 13.

13a. Please provide the percentage split between male and female of your employees in ONTARIO **by each occupation in 1981.** Record your answer on Chart 13, column 13a.

13b. Please provide the percentage split between male and female employees by occupation in ONTARIO in **1984.** Record your answer in Column 13b.

CHART 13

EMPLOYMENT STRUCTURE BY SEX AND OCCUPATION IN ONTARIO

	13a 1981 EMPLOYMENT			13b 1984 EMPLOYMENT		
	MALE	FEMALE	TOTAL	MALE	FEMALE	TOTAL
MANAGERIAL, ADMINISTRATIVE & RELATED	___% + ___%		=100%	___% + ___%		=100%
NATURAL SCIENCE, ENGINEERING & MATHEMATICS						
• Electrical Engineers	___% + ___%		=100%	___% + ___%		=100%
• All Other Engineers	___% + ___%		=100%	___% + ___%		=100%
• Engineering Technicians & Technologists	___% + ___%		=100%	___% + ___%		=100%
• Systems Analysts & Computer Programmers	___% + ___%		=100%	___% + ___%		=100%
PROCESSING	___% + ___%		=100%	___% + ___%		=100%
MACHINING						
• Welding/Soldering	___% + ___%		=100%	___% + ___%		=100%
FABRICATING, ASSEMBLING & REPAIRING						
• Business & Commercial Machines Fabricating & Assembling	___% + ___%		=100%	___% + ___%		=100%
• Electronic Equipment Fabricating & Assembling	___% + ___%		=100%	___% + ___%		=100%
• Inspecting & Testing	___% + ___%		=100%	___% + ___%		=100%
• Business & Commercial Machine Mechanics & Repairmen	___% + ___%		=100%	___% + ___%		=100%
MATERIAL HANDLING AND RELATED	___% + ___%		=100%	___% + ___%		=100%
FIRM'S TOTAL EMPLOYEES IN ONTARIO	___% + ___%		=100%	___% + ___%		=100%

(SIC 318)

14. ORGANIZED LABOUR IN YOUR FIRM IN ONTARIO

14a. Does your firm have any workers in ONTARIO covered by a collective labour agreement(s)?

Yes ☐ No ☐ **If no, go on to Question 14c.**

14b. If yes, what percent of your firm's total employment in ONTARIO is currently (1984) unionized?

____%

14c. What percent of your firm's total employment in ONTARIO do you estimate will be unionized by 1985, 1990 and by 1995?

- 1985? ____%
- 1990? ____%
- 1995? ____%

14d. If you expect an increase in the percent of total employment that will be unionized, please indicate the specific occupational groups within which you expect the increase will take place.

_____

_____

(SIC 318)

15. ORGANIZED LABOUR AND TECHNOLOGY CHANGE

If any of the employees in your firm in ONTARIO are represented by a union, please answer the following series of questions. If none of the workers in your firm in ONTARIO are unionized, please go on to Question 16, p. 22.

15a. Please indicate the name of the union(s) in your firm in ONTARIO. Record your answers on Chart 15, on line 15a.

15b. On line 15b, please indicate the number of the firm's employees in ONTARIO in each union.

15c. On line 15c, indicate the worker groups in your firm the union(s) represents.

15d. On line 15d, check ☑ if the contract(s) has a technology change clause(s).

15e. On line 15e, check ☑ if the technology change clause(s) covers any of the following:

- Notice/Disclosure
- Consultation/Participation
- Joint Technology Change Committee
- Job Security
- Seniority
- Other (please specify).

15f. On line 15f, indicate whether the clause(s) is effectively administered. If your answer is "NO", please explain your answer.

(SIC 318)

CHART 15

ORGANIZED LABOUR IN ONTARIO

	(name of union)	(name of union)	(name of union)
15a. Name of Unions in Firm			
15b. Number of Firm's Employees in Each Union			
15c. Worker Groups Represented by Each Union			
15d. Does Union(s) Contract(s) Have a Technology Change Clause(s)?			
YES	☐	☐	☐
NO	☐	☐	☐
15e. Check ☑ if Technology Change Clause(s) Includes:			
• Notice/Disclosure	☐	☐	☐
• Consultation/Participation	☐	☐	☐
• Joint Technology Change Committee	☐	☐	☐
• Job Security	☐	☐	☐
• Seniority	☐	☐	☐
• Other _____ (specify)	☐	☐	☐
15f. Is the Clause Effectively Administered?			
YES	☐	☐	☐
NO	☐	☐	☐
If 'NO', explain			

(SIC 318)

...eral, what has been the union's position on the adoption of new ... in your firm? Please explain.

(SIC 318)

16. THE NATURE OF WORKER INVOLVEMENT IN THE PROCESS OF TECHNOLOGY ADOPTION

The following questions are on the nature of the **relationship between workers and management** in your firm as decisions are made on the adoption of new technology.

16a. Does your firm have a formal mechanism for worker participation in any of the following? Please Check ☑ Yes or No

	YES	NO
• Setting production and/or sales targets:		
- at company level?	☐	☐
- at division/plant level?	☐	☐
- at department/area level?	☐	☐
- at working group level?	☐	☐
• Improving productivity/quality?	☐	☐
• Adoption of new technology?	☐	☐

16b. In your opinion, to what extent and how should management involve workers in decisions regarding the adoption of new technologies? Please comment.

_____
_____
_____
_____
_____
_____

(SIC 318)

17. FUTURE CAPITAL INVESTMENTS

17a. Please indicate how much, **in today's dollars**, your firm plans to spend on **construction of structures and buildings** in ONTARIO over the period **1985 to 1990** and over the period **1991 to 1995**. Record your answer on Chart 17, column 17a.

17b. What percent of this spending can be directly attributed to the adoption of **new technologies**? Record under column 17b.

17c. Would you indicate how much, **in today's dollars**, your firm plans to spend on **machinery and equipment** over the period 1985 to 1990 and over the period **1991 to 1995** in ONTARIO. Record under column 17c.

17d. What percent of this spending on **machinery and equipment** will be for **new technologies**? Record under column 17d.

17e. Please indicate what criterion your firm will likely use to justify the financial investment in the new technologies.

Pay-back period ☐ _____
If Yes, how long?

Return on investment ☐ _____
If Yes, what rate?

Other _____ ☐ _____
(specify) Please elaborate

17f. Considering now your total capital investment in new technology over the next 10 years, what percent will be funded through internal funds and what percent will be funded through external funds?

Internal funds ___%
External funds ___%
100%

CHART 17

CAPITAL INVESTMENT PLANS
IN ONTARIO

	INVESTMENT IN STRUCTURES & BUILDINGS		INVESTMENT IN MACHINERY & EQUIPMENT	
	17a	17b	17c	17d
	IN TODAY'S DOLLARS (In Thousands $)	% DIRECTLY RELATED TO NEW TECHNOLOGY	IN TODAY'S DOLLARS (In Thousands $)	% FOR NEW TECHNOLOGY
1985 to 1990?	$_____	_____%	$_____	_____%
1991 to 1995?	$_____	_____%	$_____	_____%

(SIC 318)

18. PLANNING FOR CHANGES IN TECHNOLOGY

These questions ask about your firm's plans for adopting new technologies in ONTARIO.

18a. Does your firm currently have a long-term strategic plan?

Yes ☐ No ☐

18b. Does your firm have a plan to deal with future human resource needs?

Yes ☐ No ☐ **If no, go to Question 18d.**

18c. Up to what year has your firm planned for its human resource needs?

_____
(WRITE IN YEAR)

18d. Does your firm have a capital investment plan dealing with the adoption of new technologies?

Yes ☐ No ☐ **If no, go to Question 19. on p. 25.**

18e. Up to what year has your firm planned for its capital requirements?

_____
(WRITE IN YEAR)

18f. On a scale of 1 to 5, please indicate to what extent these two plans (capital investment and human resource plans) are integrated.

(Please circle answer)

NOT AT ALL INTEGRATED	1	2	3	4	5	HIGHLY INTEGRATED

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19. Please indicate below any other comments on the issue of employment and new technology you wish to make.

_____

_____

_____

_____

_____

_____

_____

_____

THANK YOU FOR YOUR PARTICIPATION

OFFICE AND STORE MACHINERY MANUFACTURERS

Number of Firms and Unions Responding by Question

Question		Firms
Question 1	1982-1983	6
	1983-1984	6
	1984-1985	6
	1985-1990	6
	1990-1995	6
Question 2		*
Question 3	a,b,c	7
Question 4	a,b,c	7
Question 5	a,b,c	6
Question 6	a,b	7
Question 7	a	5
	b	4
Question 8	a	7
	b	6
Question 9	a	7
	b	7
	c	7
Question 10	a,b,c,d,e	7
Question 11	a,b,c,	7
	d	7
	e	6
	f	6

Question		Firms
Question 12	a,b,c,d,e	6
Question 13		*
Question 14	a	7
	b	2
	c	6
	d	0
Question 15	a	2
	b	1
	c	*
	d	1
	e	0
	f	0
	g	0
Question 16	a	7
	b	6
Question 17	a	5
	b	5
	c	6
	d	6
	e	5
	f	5
Question 18	a	6
	b	6
	c	4
	d	6
	e	4
	f	5

* Data not used and therefore, number of responses not reported.

APPENDIX C

RELIABILITY OF THE SAMPLE

SAMPLE RELIABILITY

The sample reliability is summarized with other sample and population characteristics in "Table 1". The sample was selected as a three stage stratified random sample. The purpose of this stratification was to reduce the error variance in the measurement of organization size by increasing the homogeneity of each group of organizations within each strata.

The first stage consisted in creating two industry sectors (i.e. manufacturing and services). The second stage involved dividing up each industry sector into nine and fourteen industrial sub-classes respectively and according to Standard Industrial Classification codes (see Table 1). The third stage was to further stratify each SIC into three more homogeneous size groups:

	Manufacturing Sector	Service Sector
Small	20- 99 employees	20-199 employees
Medium	100-499 employees	200-999 employees
Large	500+ employees	1,000+ employees

Exceptions to these three size groupings are as follows:

SECTOR		ORGANIZATION SIZE EXCLUSION
Manufacturing Sector		
291	Iron & Steel Mills	less than 500
321	Aircraft & Aircraft Parts	less than 50
Service Sector		
701	Banks and Trusts	less than 50
721	General and Life Insurance	less than 50
735	Insurance Brokers	less than 50
909	Federal Government	less than 500
931	Provincial Government	less than 200
951	Local Government	less than 500

Overall, the sample yields a relatively high reliability level in reflecting the employment level of those sectors surveyed. For instance, the sample for the Office and Store Machinery Industry yields a minimum confidence level of about 99 percent with an associated allowable error of 5 percent. That is, we would expect that the estimated employment level for the sector has a 99 percent chance of being within $\pm$ 5 percent of the actual employment level found in the frame. Or stated alternatively, if 100 independent random samples were drawn, in 99 of these samples we would expect to have an estimated employment level within $\pm$ 5 percent of the actual employment level found in the sample frame.

TABLE 1: SUMMARY - SELECTED MANUFACTURING INDUSTRIES

SAMPLE FRAME AND SAMPLE

SIC Code	SIC NAME	UNIVERSE		SAMPLE FRAME				SAMPLE				
		Number of Firms	Number of Employees[1]	Firm Size Cut Off	Number of Firms	Number of Employees[2]	Share of Universe	Number of Firms	Number of Unions	Number of Employees	Reliability Level (min.)	Allowable Error
											percent	
291	Iron and Steel Mills	17	41,603	500	7	39,900	96	3	1	21,833	90	23
304	Metal Stamping, Pressing and Coating Industry	185	17,730	20	145	17,200	97	14	3	4,507	99	5
306	Hardware, Tool and Cutlery Manufacturing	225	12,826	20	135	11,500	90	11	6	1,489	94	5
309	Miscellaneous Metal Fabricating Industries	132	12,235	20	110	12,000	98	11	6	2,694	99	5
315	Miscellaneous Machinery and Equipment Manufacturers	304	36,904	20	262	36,500	99	12	3	3,972	99	5
318	Office and Store Machinery Manufacturers	29	10,485	20	29	9,800	93	7	0	11,814	99	5
335	Communications Equipment Manufacturers	67	28,090	20	65	27,800	99	12	2	14,946	90	11
321	Aircraft and Aircraft Parts Manufacturers	22	12,732	50	17	12,000	94	10	5	11,737	95	7
165	Plastic Processing	196	19,218	20	169	18,800	98	13	4	2,400	99	5

(1) Source: Census of Manufacturing, 1982, Statistics Canada, Catalogue No. 31-203.

(2) Rounded to nearest 100.

APPENDIX D

HISTORICAL TABLES

TABLE D.1

MAJOR PRODUCTS OF THE CANADIAN OFFICE AND STORE MACHINERY MANUFACTURERS

	VALUE OF SHIPMENTS IN 1981 ($ MILLIONS)	PERCENT OF TOTAL SHIPMENTS
Electronic computer equipment and parts	604.1	52.7
Office machinery including cash registers, accounting machines	395.6	34.5
Scales	25.9	2.3
All other products*	120.9	10.5
Total	1,146.5	100.0

* Includes adjustments and estimates for small establishments not reporting detail.

SOURCE: Statistics Canada, Office and Store Machinery Manufacturers, Cat. No. 42-216, Table 5.

TABLE D.2

OFFICE AND STORE MACHINERY MANUFACTURERS (SIC 318)
ONTARIO
1971 - 1984
Current Dollars

	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
ESTABLISHMENTS (Number)	24	26	29	33	31	31	28	33	38	50	46	62		
CAPACITY UTILIZATION RATE, CANADA	73.4	79.5	85.0	91.4	85.2	79.2	77.2	84.0	94.3	94.5	90.6	69.1	59.1	
OUTPUT ($ Million)														
MANUFACTURING SHIPMENTS	198.1	246.3	260.3	320.3	336.1	345.9	320.6	389.3	495.3	612.2	799.9	823.2		
MANUFACTURING VALUE ADDED	47.3	64.0	106.6	147.5	115.4	128.8	108.4	119.9	177.4	243.8	297.2	328.7		
WAGES & SALARIES	58.1	71.5	85.7	103.6	84.3	87.9	83.8	91.9	110.9	148.1	219.5	247.4		
EMPLOYMENT (Number)														
PRODUCTION WORKERS	4,113	4,344	4,695	5,018	3,923	3,780	3,151	3,457	3,621	4,006	4,214	4,453		
ADMINISTRATIVE STAFF	2,765	3,858	3,780	4,093	3,061	2,822	2,629	2,429	2,812	3,669	5,962	6,032		
TOTAL	6,878	8,202	8,475	9,111	6,984	6,602	5,780	5,886	6,433	7,675	10,176	10,485		
CAPITAL INVESTMENT, CANADA ($ Million)														
CONSTRUCTION	x	3.2	x	x	x	2.8	8.4	7.8	10.5	29.0	x	50.4	28.0	32.9
MACHINERY & EQUIPMENT	x	6.6	x	x	x	10.2	15.9	25.1	36.0	36.0	x	60.6	68.8	84.7
TOTAL	8.2	9.8	9.6	18.3	28.1	13.0	24.3	32.9	46.5	65.0	103.1	111.0	96.8	117.6
COMPETITIVENESS														
VALUE ADDED/EMPLOYEE (Dollars)	9,789	10,235	12,581	16,186	16,547	19,508	18,758	20,372	27,569	31,771	29,209	31,352		
VALUE ADDED/$ LABOUR	1.16	1.17	1.24	1.42	1.37	1.47	1.29	1.30	1.60	1.65	1.35	1.33		
VALUE ADDED/$ LABOUR (United States)	1.98	2.15	2.32	2.38	2.12	2.47	2.51	2.52	2.61	2.47	2.57	2.59		
EXPORTS ($ Million)	150.5	183.4	199.3	212.0	262.8	302.2	284.2	356.2	518.9	575.9	663.5	655.9	794.8	
IMPORTS ($ Million)	349.7	429.8	493.8	648.8	658.2	712.4	786.0	1,063.6	1,299.2	1,829.1	2,436.0	2,532.8	2,693.8	
TRADE BALANCE ($ Million)	(199.2)	(246.4)	(294.5)	(436.8)	(395.4)	(410.2)	(501.9)	(707.5)	(780.3)	(1,253.2)	(1,772.5)	(1,876.9)	(1,899.0)	
NORMALIZED TRADE BALANCE	(0.398)	(0.402)	(0.425)	(0.507)	(0.429)	(0.404)	(0.469)	(0.498)	(0.429)	(0.521)	(0.572)	(0.589)	(0.544)	

( ) indicates deficit x - Secured to meet secrecy requirements of the Statistics Act.

NOTE: Capacity Utilization Rate shown is for Total Machinery except Electrical.

SOURCE: Statistics Canada, MANUFACTURING INDUSTRIES OF CANADA: NATIONAL AND PROVINCIAL AREAS, Cat. No. 31-203; CAPACITY UTILIZATION RATES IN CANADIAN MANUFACTURING, Cat. No. 31-003; and External Trade Division, Special Runs. United States data supplied by Coopers & Lybrand. Calculations by Economics Practice, Currie, Coopers & Lybrand.

TABLE D.3

OFFICE AND STORE MACHINERY MANUFACTURERS (SIC 318)
ONTARIO
1971 - 1984
PER CENT CHANGE
Current Dollars

	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
ESTABLISHMENTS (Number)	8.3	11.5	13.8	-4.1	0.0	-9.7	17.9	15.2	31.6	-0.0	34.8		
OUTPUT ($ Million)													
MANUFACTURING SHIPMENTS	24.3	5.7	23.1	4.9	2.9	-7.3	21.4	27.2	23.6	30.7	2.9		
MANUFACTURING VALUE ADDED	24.7	27.0	38.3	-21.0	11.6	-15.8	10.6	47.9	37.5	21.9	10.6		
WAGES & SALARIES	23.0	19.8	21.0	-18.7	4.2	-4.7	9.7	20.6	33.6	48.2	12.7		
EMPLOYMENT (Number)													
PRODUCTION WORKERS	5.6	8.1	6.9	-21.8	-3.6	-16.6	9.7	4.7	10.6	5.2	5.7		
ADMINISTRATIVE STAFF	39.5	-2.0	8.3	-25.7	-7.2	-6.8	-7.6	15.8	30.5	62.5	1.2		
TOTAL	19.2	3.3	7.5	-23.6	-5.2	-12.5	1.8	9.3	19.3	32.6	3.0		
CAPITAL INVESTMENT, CANADA ($ Million)													
CONSTRUCTION	-	-	-	-	-	200.0	-7.1	34.6	176.2	-	-	-44.4	17.5
MACHINERY & EQUIPMENT	-	-	-	-	-	55.9	57.9	43.4	0.0	-	-	13.5	23.1
TOTAL	19.5	-2.0	90.6	53.6	-53.7	86.9	35.4	41.3	39.8	58.6	7.7	-12.8	21.5
COMPETITIVENESS													
VALUE ADDED/EMPLOYEE	4.6	22.9	28.7	2.4	17.8	-3.8	8.6	35.3	15.2	-8.1	7.3		
EXPORTS	21.8	8.7	6.4	24.0	15.0	-6.0	25.3	45.7	11.0	15.2	-1.2	21.2	
IMPORTS	22.9	14.9	31.4	1.4	8.2	10.3	35.3	22.1	40.8	33.2	4.8	6.4	

SOURCE: Calculated from Table 2 by Economics Practice, Currie, Coopers & Lybrand. Calculations based on unrounded data where available.

TABLE D.4

OFFICE AND STORE MACHINERY MANUFACTURERS (SIC 318)
ONTARIO
1971 - 1984
Constant 1971 Dollars

	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
ESTABLISHMENTS (Number)	26	26	29	33	31	31	28	33	39	50	46	42		
CAPACITY UTILIZATION RATE, CANADA	73.4	79.5	85.0	91.4	85.2	79.2	77.2	84.0	94.3	94.5	90.6	69.1	59.1	
OUTPUT ($ Million)														
MANUFACTURING SHIPMENTS	198.1	n.a.	n.a.	n.a.	235.5	228.6	201.8	230.6	265.3	294.5	363.1	323.3		
MANUFACTURING VALUE ADDED	67.3	82.1	88.3	102.3	94.3	107.2	105.6	138.0	159.1	198.4	248.1	228.9		
WAGES & SALARIES	58.1	68.7	76.8	83.4	81.4	89.2	92.2	93.2	98.8	70.9	94.1	95.6		
EMPLOYMENT (Number)														
PRODUCTION WORKERS	4,113	4,344	4,695	5,018	3,923	3,789	3,151	3,457	3,421	4,006	4,214	4,453		
ADMINISTRATIVE STAFF	2,765	3,858	3,780	4,093	3,041	2,822	2,629	2,429	2,812	3,469	5,962	6,032		
TOTAL	6,878	8,202	8,475	9,111	6,964	6,602	5,780	5,886	6,433	7,475	10,176	10,485		
CAPITAL INVESTMENT CANADA ($ Million)														
CONSTRUCTION	x	3.0	x	x	x	1.8	5.0	4.3	5.3	13.1	x	18.6	9.8	11.2
MACHINERY & EQUIPMENT	x	6.4	x	x	x	6.9	9.9	14.0	18.3	16.6	x	23.2	25.5	29.9
TOTAL	8.2	9.4	8.7	14.4	19.5	8.7	14.9	18.3	23.6	29.7	42.1	41.8	35.3	41.1
COMPETITIVENESS														
VALUE ADDED/EMPLOYEE (Dollars)	9,789	10,005	10,423	11,224	13,546	16,243	18,265	23,443	24,726	25,851	24,381	21,833		

n.a. - not available as the deflator used is secured to meet secrecy requirements of the Statistics Act.

NOTE: Calculations based on unrounded data where available. Shipments data deflated by the Industry Selling Price Index for Machinery Industries (except electrical) as the index for SIC 318 is secured for all required years to meet secrecy requirements of the Statistics Act. Value added deflated by the Implicit Price Index for Gross Domestic Product for SIC 318. Wages and Salaries deflated by the Implicit Price Index for Personal Expenditure on Consumer Goods and Services; and Capital Investment deflated by the Implicit Price Indexes for Business Non-Residential Non-Residential Construction and Machinery and Equipment.

SOURCE: Publications as outlined in Table 1. Also Statistics Canada, INDUSTRY PRICE INDEXES, Cat. No. 62-011; GROSS DOMESTIC PRODUCT BY INDUSTRY, Cat. No. 61-005; and NATIONAL INCOME AND EXPENDITURE ACCOUNTS, Cat. No. 13-201. Calculations and forecast deflators by Economics Practice, Currie, Coopers & Lybrand.

OFFICE AND STORE MACHINERY MANUFACTURERS (SIC 318)
ONTARIO
1971 - 1984
PER CENT CHANGE
Constant 1971 Dollars

	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
ESTABLISHMENTS (Number)	8.3	11.5	13.8	-6.1	0.0	-9.7	17.9	15.2	31.6	-8.0	34.8		
OUTPUT ($ Million)													
MANUFACTURING SHIPMENTS	-	-	-	-	-2.9	-11.7	14.3	15.0	11.0	16.5	-5.8		
MANUFACTURING VALUE ADDED	21.9	7.6	15.8	-7.8	13.7	-1.6	30.7	15.3	24.7	25.0	-7.7		
WAGES & SALARIES	18.2	11.7	8.7	-26.4	-3.6	-11.8	2.0	10.4	20.7	32.6	1.6		
EMPLOYMENT (Number)													
PRODUCTION WORKERS	5.6	8.1	4.9	-21.8	-3.6	-16.6	9.7	4.7	10.6	5.2	5.7		
ADMINISTRATIVE STAFF	39.5	-2.0	8.3	-25.7	-7.2	-6.8	-7.6	15.8	30.5	62.5	1.2		
TOTAL	19.2	3.3	7.5	-23.6	-5.2	-12.5	1.8	9.3	19.3	32.6	3.0		
CAPITAL INVESTMENT, CANADA ($ Million)													
CONSTRUCTION	-	-	-	-	-	177.8	-14.0	23.3	147.2	-	-	-47.3	14.3
MACHINERY & EQUIPMENT	-	-	-	-	-	43.5	41.4	30.7	-9.3	-	-	9.9	17.3
TOTAL	14.6	-7.4	65.5	35.4	-55.4	71.3	22.8	29.0	25.8	41.8	-0.7	-15.6	16.4
COMPETITIVENESS													
VALUE ADDED/EMPLOYEE	2.2	4.2	7.7	20.7	19.9	12.4	28.4	5.5	4.6	-5.7	-10.5		

TABLE D.5

SOURCE: Calculated from Table 4 by Economics Practice, Currie, Coopers & Lybrand. Calculations based on unrounded data where available.

TABLE D.6

OCCUPATIONAL INDICATORS: OFFICE AND STORE MACHINERY MANUFACTURERS

RANKING BY RELATIVE STRENGTH

		NUMBER OF EMPLOYEES 1981	AVERAGE ANNUAL RATE OF CHANGE PERCENT 1971 - 1981
I	TOTAL INDUSTRY	12,135	1.9
II	TWO DIGIT LEVEL		
	MATERIAL HANDLING AND RELATED	80	0.0
	PRODUCT FABRICATING, ASSEMBLING AND REPAIRING	2,930	1.6
	MACHINING AND RELATED	340	2.5
	NATURAL SCIENCES, ENGINEERING AND MATHEMATICS	2,765	5.5
	MANAGERIAL, ADMINISTRATIVE AND RELATED	2,115	7.1
	PROCESSING	40	23.1
III	FOUR DIGIT LEVEL		
	PRODUCT FABRICATING, ASSEMBLING AND REPAIRING		
	Business and Commercial Machine Mechanics and Repairmen	510	(7.5)
	Foremen: Mechanics and Repairmen, n.e.c.	115	(0.4)
	Business and Commercial Machine Fabricating and Assembling, n.e.c.	485	2.2
	Inspecting and Testing: Fabricating, Assembling, Installing and Repairing, Electrical, Electronic and Related Equipment	330	13.9
	Electronic Equipment Fabricating and Assembling	565	15.8
	Electronic and Related Equipment Installing and Repairing, n.e.c.	285	19.0
	TOTAL	2,930	1.6
	MACHINING AND RELATED		
	Welding and Flame Cutting	145	10.2
	TOTAL	340	2.5

TABLE D.6 (Cont'd)

OCCUPATIONAL INDICATORS: OFFICE AND STORE MACHINERY MANUFACTURERS

RANKING BY RELATIVE STRENGTH

	NUMBER OF EMPLOYEES 1981	AVERAGE ANNUAL RATE OF CHANGE PERCENT 1971 - 1981
NATURAL SCIENCES, ENGINEERING AND MATHEMATICS		
Systems Analysts, Computer Programmers and Related	1,020	0.9
Industrial Engineers	315	6.4
Mechanical Engineers	105	8.8
Electrical Engineers	545	10.0
Architectural and Engineering Technologists and Technicians	550	12.1
Draughtsmen	135	18.4
TOTAL	2,765	5.5
MANAGERIAL, ADMINISTRATIVE AND RELATED		
Occupations Related to Management and Administration, n.e.c.	190	(1.9)
General Managers and Other Senior Officials	165	5.1
Accountants, Auditors and Other Financial Officers	400	5.2
Sales and Advertising Management	245	6.5
Other Managers and Administrators, n.e.c.	230	7.7
Personnel and Industrial Relations Management	105	10.1
Management: Natural Sciences, Engineering and Mathematics	205	21.2
Production Management	280	23.1
TOTAL	2,115	7.1

() Indicates decline

NOTE: Details do not add to totals as all occupations are not included.

SOURCE: Census data, Ontario Ministry of Labour.

OCCUPATIONAL INDICATORS: OFFICE AND STORE MACHINERY MANUFACTURERS

RANKING BY INCREASE IN FEMALE REPRESENTATION

		FEMALES EMPLOYED 1981	FEMALE EMPLOYMENT AS A PERCENT OF TOTAL 1971	1981	NUMBER OF JOBS GAINED BY FEMALES 1971-1981
I.	TOTAL INDUSTRY	3,905	24.5	32.2	1,450
II.	TWO DIGIT LEVEL				
	MATERIAL HANDLING AND RELATED	25	37.5	31.3	(5)
	PROCESSING	15	0.0	37.5	15
	MACHINING AND RELATED	120	11.3	35.3	90
	NATURAL SCIENCES, ENGINEERING AND MATHEMATICS	340	9.9	12.3	180
	MANAGERIAL, ADMINISTRATIVE AND RELATED	365	10.3	17.3	255
	PRODUCT FABRICATING, ASSEMBLING AND REPAIRING	1,030	14.2	35.2	675
III.	FOUR DIGIT LEVEL				
	MACHINING AND RELATED				
	Welding and Flame Cutting	80	36.4	55.2	60
	TOTAL	120	11.3	35.3	90
	NATURAL SCIENCES, ENGINEERING AND MATHEMATICS				
	Mechanical Engineers	0	0.0	0.0	0
	Electrical Engineers	25	4.8	4.6	15
	Draughtsmen	20	0.0	14.8	20
	Industrial Engineers	30	0.0	9.5	30
	Architectural and Engineering Technologists and Technicians	55	2.9	10.0	50
	Systems Analysts, Programmers and Related	210	15.1	20.6	70
	TOTAL	340	9.9	12.3	180

OCCUPATIONAL INDICATORS: OFFICE AND STORE MACHINERY MANUFACTURERS

RANKING BY INCREASE IN FEMALE REPRESENTATION

	FEMALES EMPLOYED 1981	FEMALE EMPLOYMENT AS A PERCENT OF TOTAL 1971	1981	NUMBER OF JOBS GAINED BY FEMALES 1971-1981
MANAGERIAL, ADMINISTRATIVE AND RELATED				
Other Managers and Administrators, n.e.c.	55	63.6	23.9	(15)
Management: Natural Sciences, Engineering and Mathematics	0	0.0	0.0	0
General Managers and Other Senior Officials	5	0.0	3.0	5
Sales and Advertising Management	20	0.0	8.2	20
Personnel and Industrial Relations Management	25	0.0	23.8	25
Production Management	35	0.0	12.5	35
Accountants, Auditors and Other Financial Officers	80	4.2	20.0	70
Occupations Related to Management and Administration, n.e.c.	85	4.3	44.7	75
TOTAL	365	10.3	17.3	255
PRODUCT FABRICATING, ASSEMBLING AND REPAIRING				
Foremen: Mechanics and Repairmen, n.e.c.	0	0.0	0.0	0
Business and Commercial Machine Mechanics and Repairmen	25	2.2	4.9	0
Electronic and Related Equipment Installing and Repairing, n.e.c.	20	0.0	7.0	20
Inspecting and Testing: Fabricating, Assembling, Installing and Repairing Electrical, Electronic and Related Equipment	105	16.7	31.8	90
Business and Commercial Machines Fabricating and Assembling, n.e.c.	285	39.7	58.8	130
Electronic Equipment Fabricating and Assembling	345	42.3	61.1	290
TOTAL	1,030	14.2	35.2	675

TABLE D.7 (Cont'd)

( ) Indicates decline.

NOTE: Females employed in 1981 is calculated from percent of total.
Details do not add to totals as all occupations are not included.

SOURCE: Census data, Ontario Ministry of Labour.

FINAL REPORT AND APPENDICES OF THE ONTARIO TASK FORCE ON EMPLOYMENT AND NEW TECHNOLOGY

Final Report — Employment and New Technology

Appendices:

1. Labour Market Trends in Ontario, 1950-1980
2. Occupational Employment Trends in Ontario, 1971-1981
3. Emerging New Technology, 1985-95: Framework for a Survey of Firms
4. Employment and New Technology in Ontario's Manufacturing Sector: A Summary of Selected Industries
5. Employment and New Technology in the Iron and Steel Industry
6. Employment and New Technology in the Metal Fabricating Industry
7. Employment and New Technology in the Machinery and Equipment Industry
8. Employment and New Technology in the Aircraft and Aircraft Parts Industry
9. Employment and New Technology in the Communications Equipment Industry
10. Employment and New Technology in the Office, Store and Business Machine Industry
11. Employment and New Technology in the Plastic Processing Industry
12. Employment and New Technology in Ontario's Service Sector: A Summary of Selected Industries
13. Employment and New Technology in the Chartered Banks and Trust Industry
14. Employment and New Technology in the Insurance Industry
15. Employment and New Technology in the Government Services Industry
16. Employment and New Technology in the Telecommunications Industry
17. Employment and New Technology in the Retail Trade Industry
18. Employment and New Technology in the Computer Services and Management Consulting Industry
19. Industry-Sector and Occupational Employment in Ontario, 1985-1995
20. Technological Change, Productivity, and Employment: Studies of the Overall Economy